United States
Department of
Agriculture

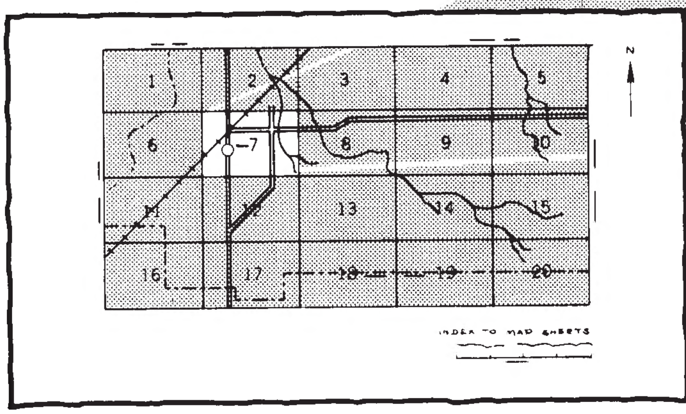
Soil
Conservation
Service

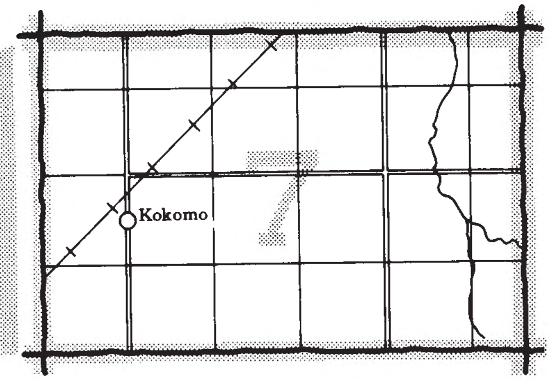
In cooperation with
United States Department
of the Interior,
Bureau of Indian Affairs
and the Montana
Agricultural
Experiment Station

Soil Survey of Roosevelt and Daniels Counties Montana

HOW TO USE

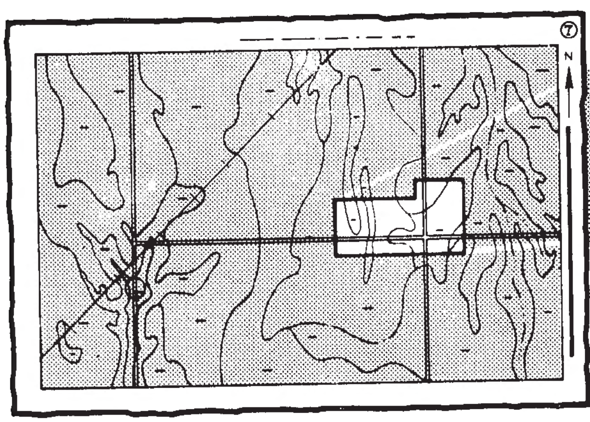
1. Locate your area of interest on the "Index to Map Sheets"

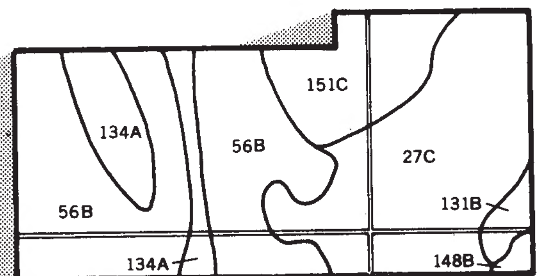




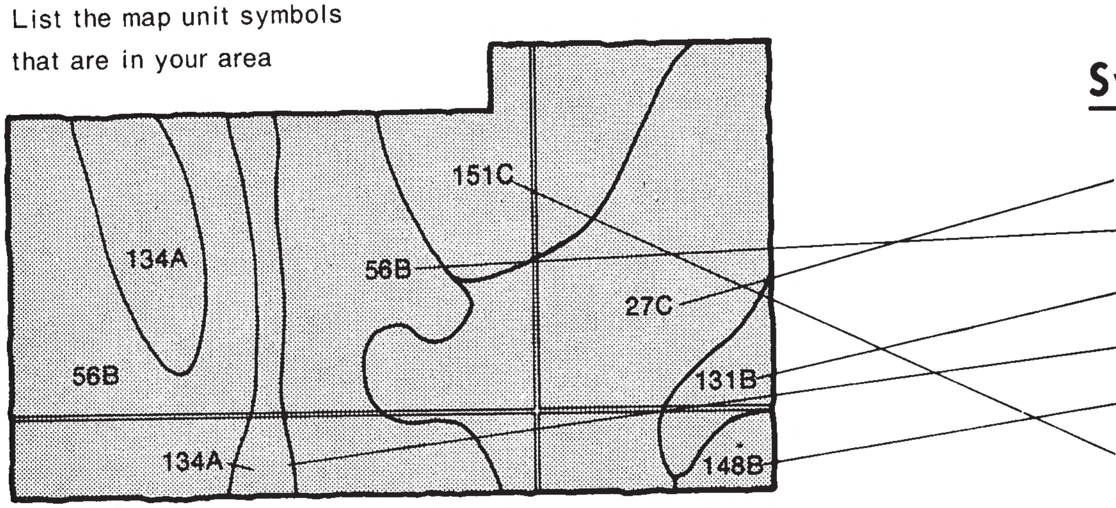
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.





4. List the map unit symbols that are in your area

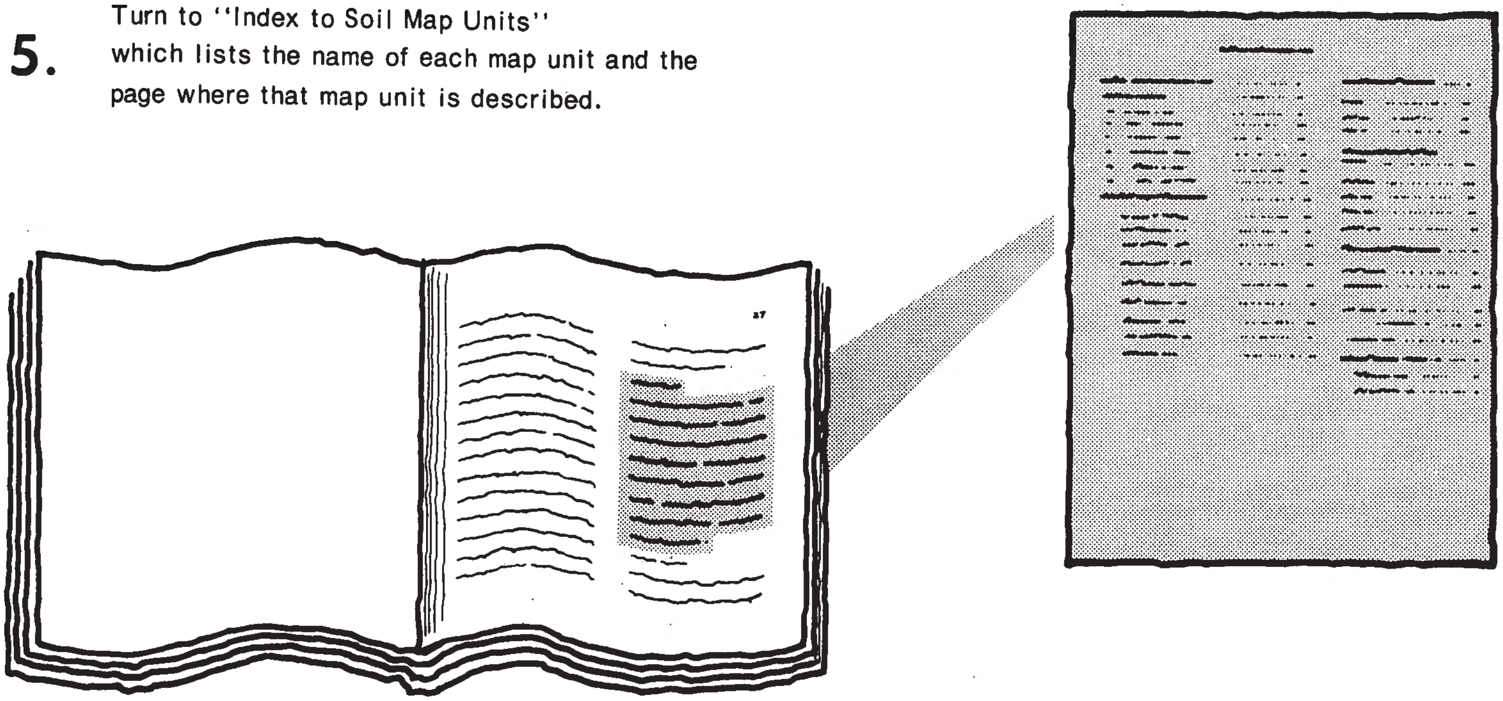


Symbols

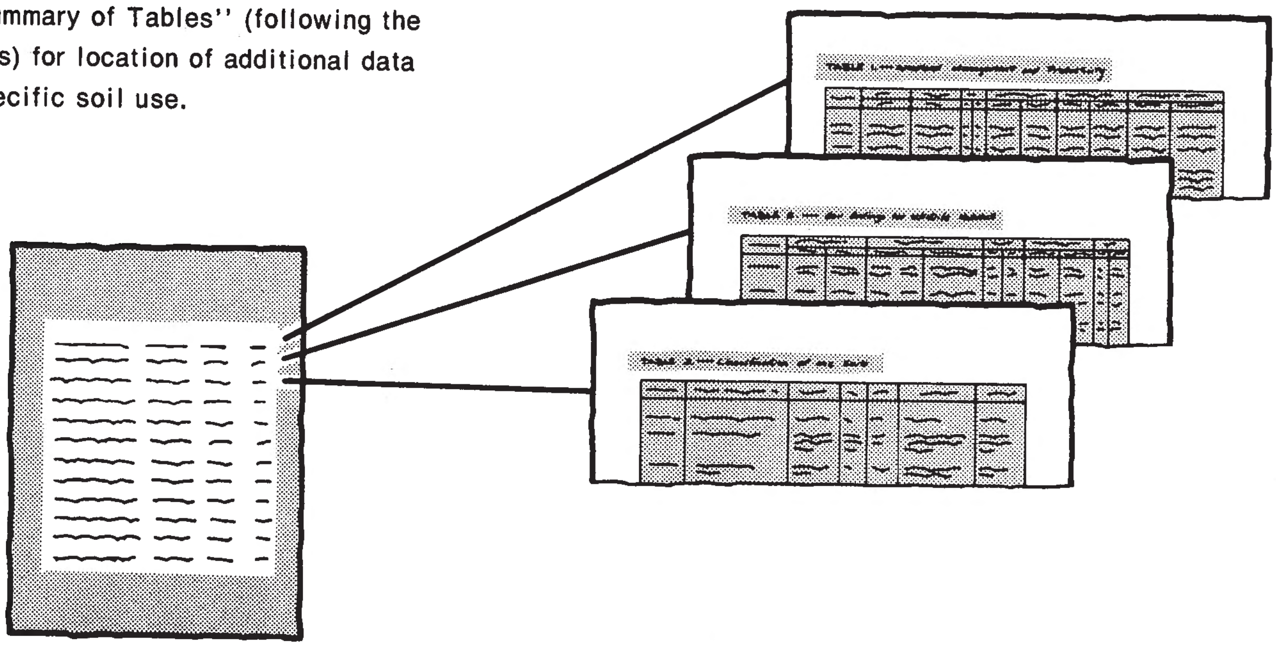
27C
56B
131B
134A
148B
151C

THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; for specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in 1980. Soil names and descriptions were approved in 1981. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1980. This survey was made cooperatively by the Soil Conservation Service, the Bureau of Indian Affairs, and the Montana Agricultural Experiment Station. It is part of the technical assistance furnished to the Culbertson-Bainville, Daniels County, and Froid Conservation Districts and the Fort Peck Indian Agency.

Financial assistance was provided by the Old West Regional Commission in cooperation with the Montana Department of State Lands and the Montana Association of Conservation Districts, and by the Boards of Commissioners for Daniels and Roosevelt Counties.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Agricultural value of the soils of the Missouri River flood plain is enhanced by flood protection provided by the Fort Peck Dam.

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Soil Series

Issued May 1985

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Foreword

This soil survey contains information that can be used in land-planning programs in Roosevelt and Daniels Counties. It contains predictions of soil behavior for selected land uses. The survey also stresses limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

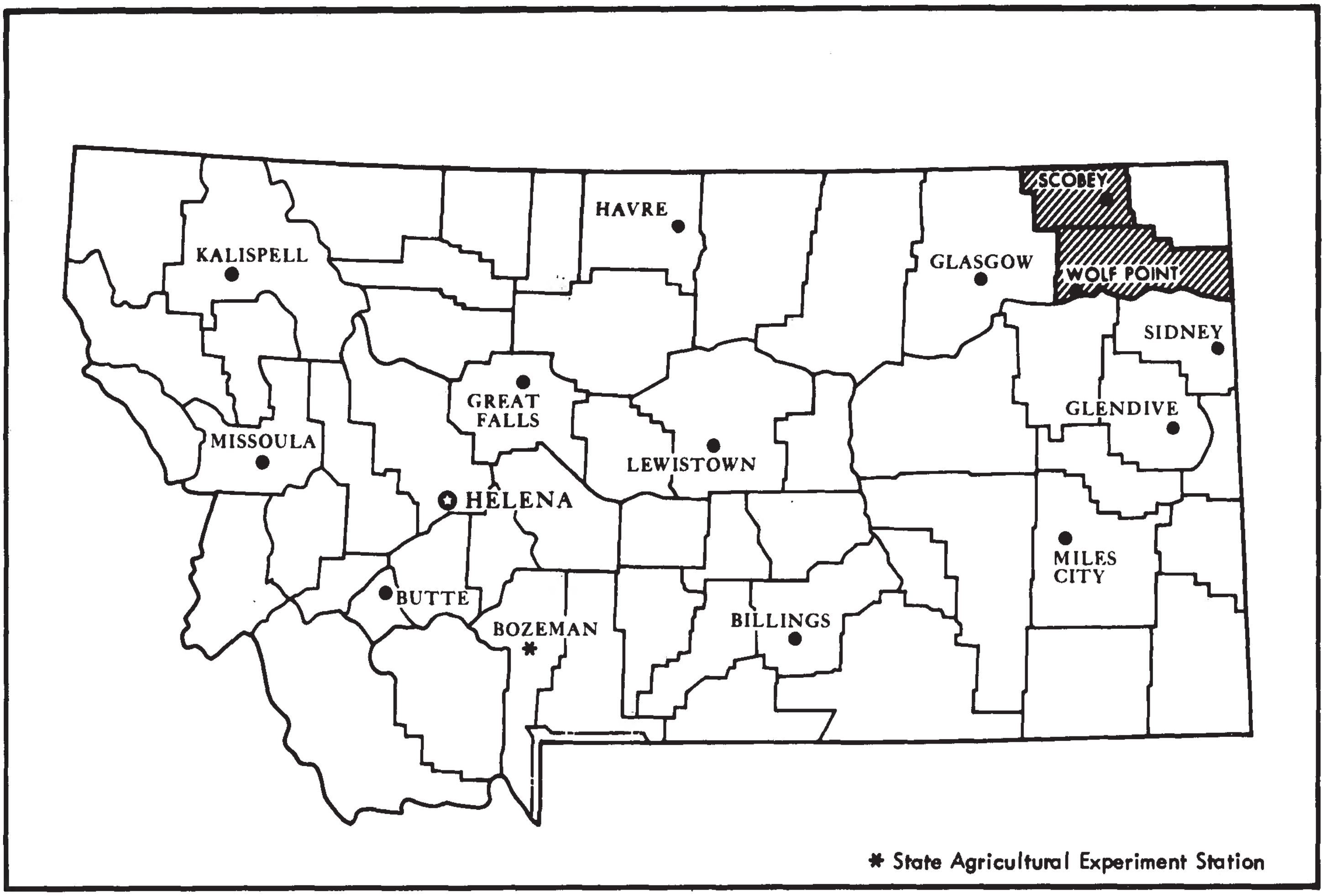
This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Soil properties can differ greatly within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to shale or sedimentary beds. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Glen H. Loomis

Glen H. Loomis
State Conservationist
Soil Conservation Service



Location of Roosevelt and Daniels Counties in Montana.

Soil Survey of
Roosevelt and Daniels Counties Montana

By Dennis R. Smetana, Soil Conservation Service

Fieldwork by Dennis R. Smetana, Michael J. Hansen,
Brian D. Dougherty, and Edward R. Stein,
Soil Conservation Service,
and Earnest L. Morton, Bureau of Indian Affairs

United States Department of Agriculture, Soil Conservation Service
In cooperation with
United States Department of the Interior, Bureau of Indian Affairs,
and Montana Agricultural Experiment Station

ROOSEVELT AND DANIELS COUNTIES are in the northeastern part of Montana. Roosevelt County has a land area of about 1,526,400 acres, or 2,385 square miles. Wolf Point, the county seat, is in the southwestern part of the county. Daniels County has a land area of about 923,520 acres, or 1,443 square miles. Scobey, the county seat, is in the central part of the county.

About 51 percent of this survey area is used as cropland, and the rest is used mainly as rangeland. The principal crops are wheat, barley, and alfalfa hay. The main economic enterprises are raising beef cattle and growing small grain.

Elevation ranges from 1,875 to 3,100 feet. The mean annual precipitation is about 13 inches, and the mean annual temperature is 40 to 45 degrees F. The growing season ranges from 105 to 125 days.

Descriptions, names, and delineations of soils in this soil survey do not fully agree with those on soil maps for adjacent counties. Differences are the result of better knowledge of soils, modifications in series concepts, intensity of mapping, or the extent of soils within the survey area.

General Nature of the Survey Area

This section discusses the history and development; physiography, relief, and drainage; ground water sources; natural resources; industry, markets, and transportation; and climate of the survey area.

History and Development

The first white men in the survey area were trappers enroute to trapping grounds in the mountains to the west and along the upper tributaries of the Missouri River. The area was part of the hunting grounds of the nomadic Assiniboine Indians. These early trappers left little record of their wanderings. The first authenticated records are those made by the Lewis and Clark Expedition, which crossed the area in 1805 and 1806.

Following the Lewis and Clark Expedition, interest in the area increased greatly and it was visited each year by increasing numbers of trappers and prospectors. In 1826 the federal government built the first Fort Union Port on the north bank of the Missouri River, near the present site of Frazer. In 1828 Fort Union was reestablished on the north bank of the Missouri River, near the present Montana-North Dakota state line. Fort Poplar was constructed in 1861; Fort Peck, in 1867. The Fort Peck Indian Reservation for the Assiniboine and Sioux Indians was established in 1888.

Following construction of the Northern Pacific Railway in 1882 and the Great Northern Railway in 1888, livestock raising became the leading industry. The settlement of public lands under the "dryland

movement," which began about 1906, saw dryland farming replace livestock raising in the more desirable farming areas. A large number of homeseekers arrived during 1908 and 1909 and again in 1912 and 1913, at the time of the construction of a railway branch from Bainville to Scobey. Each Indian was allotted 320 acres of grazing land, 40 acres of irrigable land, and 20 acres of timber land, and in 1913 the remaining lands were opened for settlement. Settlement on the reservation reached its height during 1914 and 1915. Extensive breaking up of the rangeland by the horse and plow came in 1916 and 1917, and it progressed with the advent of the tractor. During the drought in 1930 to 1940, the population in the area decreased about 20 percent.

Physiography, Relief, and Drainage

Roosevelt and Daniels Counties are in the glaciated plains region of Montana. In the recent geologic past, a sheet of glacial ice of pre-Wisconsin age covered most of the counties and extended south beyond the present course of the Missouri River. This ice sheet, estimated to have been over 1,000 feet thick, left a mantle of till as it retreated northward. Some of the material brought in by the glacier is believed to have been transported from as far north as the Hudson Bay Region in Canada. Throughout most of the area the mantle of glacial till now averages 20 to 25 feet in thickness.

Since the retreat of the glacier, erosion has removed some of the mantle of glacial till and exposed the underlying sandstone and shale. All of the rocks exposed are of sedimentary origin and range in age from Cretaceous to Recent. During the Cretaceous age, thick sequences of marine sediment were deposited as stratified shale, siltstone, and sandstone. These rocks now make up the Hell Creek Formation. Following a short period of erosion, deposition of lignite-bearing clay, silt, and sandstone of nonmarine origin took place during Tertiary time. This sequence of rocks makes up the Fort Union Formation. Capping the highland areas in the survey area is a relatively thin, highly stratified and sorted sand and gravel deposit of alluvial origin. This deposit is known as the Flaxville Gravel. The surficial deposits of glacial origin cover most of the bedrock in the other areas. Unconsolidated alluvial deposits of gravel, sand, silt, and clay of Recent age lie along the drainageways of the area.

In Roosevelt County, elevation ranges from about 1,875 feet along the Missouri River to about 2,900 feet in the northwestern part of the county. In Daniels County, elevation ranges from 2,200 feet along the Poplar River, near the southern border of the county, to nearly 3,100 feet in the northwestern part of the county. Local relief in both counties is generally less than 200 feet.

Most of the survey area consists of upland glaciated plains. The plains are nearly level to steeply sloping. In places the landscape is dissected by steep drainageways and rough ridges of weathered shale, siltstone, and sandstone. In these areas vegetation is sparse, runoff is rapid, and erosion is severe.

The survey area is within the Missouri River drainage area. The Missouri River forms the southern boundary of Roosevelt County. The major tributaries feeding into the Missouri River from Roosevelt County are Big Muddy Creek and Poplar River, which have their source in Canada. Big Muddy Creek drains the east-central part of the county. It is a sluggish, stream, flowing from north to south, that has a miry bottom and steep banks. Its chief tributary is Smoke Creek, a sluggish, silt-laden stream flowing in a southeasterly direction and uniting with the Big Muddy Creek a few miles north of Manning Lake. Other major tributaries entering the Big Muddy Creek in Roosevelt County are Lake Creek and Spring Creek from the west and Sheep Creek from the east.

The Poplar River flows southward through the central part of Roosevelt County, from the Roosevelt-Daniels county line to the north to its confluence with the Missouri River to the south. Unlike the Big Muddy Creek, the Poplar River runs clear, flows with good velocity, and has a sandy to gravelly bed. The major drainageways entering the Poplar River are Box Elder Creek, Long Creek, and West Fork Poplar River from the west and Give Out Morgan Creek and Hay Creek from the east. At its junction with the Poplar River just below the Roosevelt-Daniels county line, the West Fork Poplar River is similar to the main stem in character and is nearly as large. Cottonwood Creek is the main tributary to the West Fork Poplar River in Roosevelt County.

Wolf Creek, Little Wolf Creek, Tule Creek, and Chelsea Creek are the major drainageways in the western part of the county. The streams have narrow flood plains and are entrenched 75 to 150 feet below the level of the upland areas.

The southeastern part of Roosevelt County is drained by Little Muddy Creek and its main tributary, Shotgun Creek. These drainageways and their tributaries are deeply entrenched.

The extreme northeastern part of the county is drained by Sand Creek, which flows northward into the Medicine Lake area of Sheridan County, Montana.

Geologists believe that prior to the glaciation of the Missouri Valley, the Missouri River flowed northward into the Hudson Bay in Canada. North of the Missouri River and east of the Poplar River, a depression some 5 to 10 miles wide lies in a northeasterly direction to the Big Muddy Creek. The number of shallow basins and freshwater lakes in this depression suggests that this is the former Missouri River streambed.

In the southeastern part of Roosevelt County, between Culbertson and Lakeside by way of Bainville, there is another former streamcourse, which ranges in width from 2 to 3 miles. This depression was probably formed at the

time the waters of the Missouri River were seeking a more southerly course than their preglacial course.

The Poplar River, with its east and west forks, is the dominant stream draining Daniels County. Butte Creek drains the west-central part of the county and is a major tributary to the main stem of the Poplar River. Eagle Creek, Whitetail Creek, and Smoke Creek drain the eastern quarter of the county and feed into Big Muddy Creek, which flows through Sheridan and Roosevelt Counties. Butte Creek and the main stem and west fork of the Poplar River have rather broad flood plains. By comparison, the rest of the streams are narrow and constricted.

Ground Water Sources

The occurrence and distribution of ground water in the survey area are directly related to geology. Hydrologic characteristics of the various geologic formations determine the quality and quantity of available ground water.

Ground water aquifers of good to excellent quality in the survey area include the Flaxville Gravel, the Fox Hills Formation, the Ancestral Missouri River Channel Fill (in Roosevelt County), and the Glacial Outwash Channel material. Where adequate recharge area is available, the Flaxville Gravel yields an average of 5 to 50 gallons per minute of high quality water. The Fox Hills Formation yields an average of 10 to 100 gallons per minute of high quality water suitable for domestic or livestock use. The Ancestral Missouri River Channel Fill and the Glacial Outwash Channel material are high-yielding aquifers with excellent water quality. Water from the Ancestral Missouri River Channel Fill is suitable for domestic and livestock use and for irrigation. Potential yields in the deeper part of the channel are 1,000 to 1,500 gallons per minute. Yields from the Glacial Outwash Channel material range from 400 to 800 gallons per minute. Water is suitable for domestic and livestock use and possibly for small-scale irrigation.

Other aquifers in the survey area include the Judith River Formation, alluvium of Quaternary age, the Fort Union Formation, and the Hell Creek Formation. The Judith River Formation is an important source of ground water. It is reached by wells more than 800 feet deep in an area from Wolf Point westward. Water from the formation is highly mineralized and of variable quality. Reported yields range from 25 to 85 gallons per minute. The alluvium of Quaternary age generally yields water of good to adequate quality that is suitable for domestic and livestock use. Although yields of more than 100 gallons per minute have been obtained along major drainageways, average yields range from 10 to 25 gallons per minute. The Fort Union Formation yields water of fair to good quality at a rate of 5 to 20 gallons per minute. It is generally suitable for domestic and livestock use. The Lebo Shale Member of the formation yields highly mineralized water not suitable for domestic use. The small amount of mineralized water in the Hell Creek Formation is generally adequate for domestic or livestock use. Yield ranges from 3 to 8 gallons per minute.

The Bearpaw Shale Formation is extensive in the southwestern part of Roosevelt County. It is not considered to be a ground water aquifer. Yield is small, and the water is too highly mineralized for most uses.

Natural Resources

The most important natural resource in this survey area is the soil. Production of spring wheat and other small grain and livestock raising are the chief industries. In Roosevelt County, about 50 percent of the land is cultivated, 48 percent is rangeland and tame pastureland, and 2 percent is water areas and areas under woods, roads, and structures. In Daniels County, about 60 percent of the land is cultivated, 39 percent is rangeland and pastureland, and 1 percent is water areas and areas under roads, woods, and structures.

The supply of water is limited in this semiarid region. Natural sources of water include ponds, springs, streams, and rivers. Surface runoff is retained in livestock water dams and dugouts, while ground water is tapped by deep wells. Dikes are constructed on nearly level bottom lands along streams and drainageways to catch the seasonal runoff and spread the water over the soil. These water spreading systems help to increase hay and grain production by providing more available soil moisture.

Coal resources are extensive in the survey area, although at present there is no major mining activity. In Daniels County, most deposits have been classed nonstrippable because of the thick overburden. Two fields in Roosevelt County, the Fort Kipp and Lanark fields, are presently considered strippable. With the renewed exploration of the Fort Union Formation, which covers large areas in both Daniels and Roosevelt Counties, coal could again become an important economic resource in the survey area.

Oil, discovered in Roosevelt County in 1951, has developed into one of the county's largest industries. Production in 1974 totaled 1,062,351 barrels. Oil wells are scattered throughout the county. The central part of the county, north of the city of Poplar, has the greatest concentration of wells. Oil development in Daniels County has been limited to a few wells. The total oil resource is still being explored, and indications are that oil activities will continue for many years throughout the survey area.

There is one gasfield in Roosevelt County, and it is located in the Tule Creek field. Production in 1974 was 162,220,000 cubic feet.

Sand and gravel are plentiful in the survey area. Although the demand for sand and gravel continues to

increase, the proximity of adequate supplies limits their market value.

Woodland is a minor resource in Roosevelt County. Stands of marketable value are confined mainly to bottom lands of the Missouri River. Cottonwood trees grow on about 9,000 acres along the river. These lands are used mostly for grazing, and no commercial timber is harvested.

Considerable interest in potash as a mineral resource in Daniels County has been shown recently. Leasing and core testing have taken place, with most leasing activity centered north of the town of Scobey, along the Canadian border. Although no test results are available to date, the estimated thickness of a bed near Scobey is 200 feet.

Industry, Markets, and Transportation

Growing crops and raising livestock are the principal industries in Roosevelt and Daniels Counties. Nonirrigated farming predominates, although there is some irrigated farming. Spring wheat is the principal crop, but winter wheat, durum wheat, barley, oats, alfalfa hay, and corn are also grown. Some alfalfa, native hay, and small grain are grown on irrigated land near Wolf Point. Poorly drained bottom lands are used for native hay.

Nearly all the small grain produced is marketed through local elevators and shipped by rail or truck to terminal markets both east and west. Public stockyards provide ranchers with good livestock marketing facilities. Some cattle are sold directly off the ranch to feeder buyers.

Wolf Point, Poplar, and Culbertson in Roosevelt County and Scobey in Daniels County serve as distribution points for firms dealing in farm machinery, automobiles and trucks, construction equipment, and the service industries connected with them. At Macon in Roosevelt County, a refinery produces oil products and jet aircraft fuel. Oil was discovered in Roosevelt County in 1951, and it has grown into one of the larger industries.

The Burlington Northern Railroad serves Roosevelt County with freight and passenger service. The main line of the Burlington Northern crosses the southern part of the county adjacent to the communities of Wolf Point, Poplar, Brockton, and Culbertson. A branch line originating just north of Bainville serves the communities of McCabe and Froid. Freight service alone is provided by Burlington Northern to Daniels County.

State Highways 13 and 16 run from north to south and U.S. Highway 2 follows the southern border of Roosevelt County. Numerous secondary state highways provide good vehicle traffic throughout the rest of the county. Daniels County is served by several highways. Montana Highway 13 runs north and south from U.S. Highway 2 to the Canadian border. Montana Highway 5 runs east and west from Plentywood to Scobey.

One commercial airline carrier serves Roosevelt County from the Wolf Point Airport. Numerous small commercial airlines serve the county for short hauls and also provide spraying services.

Climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Roosevelt and Daniels Counties are usually quite warm in summer, with frequent spells of hot days and occasional cool days. The counties are very cold in winter, when arctic air frequently surges over the area. Most precipitation falls during the warm period, and it normally is heaviest late in spring and early in summer. Winter snowfall normally is not heavy, and drifting of the snow leaves much of the ground bare.

Table 1 gives data on temperature and precipitation for the survey area, as recorded at Bredette, Culbertson, Scobey, and Wolf Point in the period 1951 to 1978. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature at Bredette, Culbertson, Scobey, and Wolf Point is 13 degrees. The average daily minimum temperature is 2 degrees at Bredette, 1 degree at Culbertson, 3 degrees at Scobey, and 0 at Wolf Point. The lowest temperature on record, which occurred at both Bredette and Wolf Point on January 20, 1954, is -52 degrees. In summer the average temperature is 66 degrees at Bredette, 67 degrees at Culbertson and Scobey, and 68 degrees at Wolf Point. The average daily maximum temperature is about 83. The highest recorded temperature, which occurred at Wolf Point on July 28, 1951, is 109 degrees.

Growing degree days, shown in table 1, are equivalent to heat units. During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 12 inches at Bredette, 15 inches at Culbertson, 14 inches at Scobey, and 13 inches at Wolf Point. Of this, 80 percent usually falls from April through September. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 4.88 inches at Culbertson on June 12, 1976. Thunderstorms occur on about 30 days each year, and most occur in summer.

The average seasonal snowfall is 30 inches at Bredette, 25 inches at Culbertson, 36 inches at Scobey, and 40 inches at Wolf Point. The greatest snow depth at any one time during the period of record was 18 inches

at Bredette, 34 inches at Culbertson, 20 inches at Scobey, and 22 inches at Wolf Point.

The average relative humidity in midafternoon is about 50 percent. Humidity is higher at night, and the average at dawn is about 70 percent. The sun shines 70 percent of the time in summer and 50 percent of the time in winter. The prevailing wind is from the southwest. Average windspeed is highest, 12 miles per hour, in spring.

Several times each winter, snow storms with strong winds cause blizzard conditions in the area. Hail occurs during summer thunderstorms in small, scattered areas.

How This Survey Was Made

This survey was made to provide information about the soils or miscellaneous areas in the survey area. The information includes a description of the soils or miscellaneous areas and their location and a discussion of the suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biologic activity.

The soils or miscellaneous areas in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil or miscellaneous area is associated with a particular kind or segment of the landscape. By observing the soils or miscellaneous areas in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept or model of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Individual soils on the landscape commonly merge into one another as their characteristics gradually change. To construct an accurate map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. after the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While the soil survey was in progress, samples of some of the soils in the area were collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses and under different levels of management. Some interpretations were modified to fit local conditions, and some new interpretations were developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The soils or miscellaneous areas making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils or miscellaneous areas can be identified on the map. Likewise, areas that are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The general map units in this survey have been grouped into general kinds of landscape for broad interpretive purposes. Each of the broad groups and the map units in each group are described in the following pages.

Soils on flood plains

This group consists of four map units. It makes up about 10 percent of the survey area. The soils in this group are nearly level. Elevation is 1,875 to 2,900 feet.

The soils in this group are deep and are well drained, moderately well drained, and very poorly drained. They formed in alluvium.

This group is used mainly for nonirrigated cultivated crops, for irrigated hay, and as rangeland. It is also used for nonirrigated hay, irrigated cultivated crops, woodland, and wildlife habitat.

1. Havrelon-Trembles-Lohler

Deep, nearly level, well drained and moderately well drained, moist soils that are subject to flooding

This map unit is along the tributaries of the Missouri River except in the southwestern part of Roosevelt County. The unit is subject to occasional periods of flooding from April through June. Slope is 0 to 2 percent. Elevation is 1,875 to 2,500 feet.

This unit makes up about 2 percent of the survey area. It is about 45 percent Havrelon soils, 20 percent Trembles soils, and 10 percent Lohler soils. The remaining 25 percent is components of minor extent.

Havrelon soils are deep, well drained, and medium textured throughout. Trembles soils are deep, well drained, and moderately coarse textured throughout. Lohler soils are deep, moderately well drained, and fine textured throughout.

Of minor extent in this unit are Banks, Lallie, and Nobe soils; Typic Ustifluvents; Ustifluvents, saline; and Riverwash. The Banks soils are droughty. The Lallie and Nobe soils and Ustifluvents, saline, are salt-affected. Typic Ustifluvents and Ustifluvents, saline, are erratically stratified with very gravelly sand to clay. Riverwash is subject to frequent periods of flooding, and it supports little or no vegetation.

This unit is used mainly as rangeland. It is also used for nonirrigated cultivated crops, grass hay, and wildlife habitat.

This unit has potential for providing habitat for white-tailed deer, mule deer, sharp-tailed grouse, sage grouse, ring-necked pheasant, gray partridge, red fox, and coyote.

The main limitation of this unit for homesite development is the hazard of flooding.

2. Havrelon-Lohler-Trembles, protected

Deep, nearly level, well drained and moderately well drained, moist soils that are protected from flooding

This map unit is mostly on the parts of the Missouri River flood plain that are protected from flooding by the Fort Peck Dam (fig. 1). Slope is 0 to 2 percent. Elevation is 1,875 to 2,000 feet.

This unit makes up about 3 percent of the survey area. It is about 35 percent Havrelon soils, 35 percent Lohler soils, and 10 percent Trembles soils. The remaining 20 percent is components of minor extent.

Havrelon soils are deep, well drained, and medium textured throughout. Lohler soils are deep, moderately well drained, and fine textured throughout. Trembles soils are deep, well drained, and moderately coarse textured throughout.

Of minor extent in this unit are Bowdoin, Lallie, and Banks soils and Riverwash. The Bowdoin and Lallie soils are salt-affected. The Banks soils are droughty.

Figure 1.—An area of general map unit 2.

Riverwash is subject to frequent periods of flooding, and it supports little or no vegetation.

This unit is used mainly for nonirrigated cultivated crops and as rangeland. It is also used for irrigated hay, irrigated cultivated crops, woodland, and wildlife habitat.

This unit has potential for providing habitat for white-tailed deer, ring-necked pheasant, gray partridge, sharp-tailed grouse, raccoon, and red fox.

The main limitation of this unit for homesite development is the slow permeability of the Lohler soil.

3. Harlem-Havre-Glendive, protected

Deep, nearly level, well drained, dry soils that are protected from flooding

This map unit is on the parts of the Missouri River flood plain that are protected from flooding by the Fort Peck Dam. It is in the southwestern part of Roosevelt County. Slope is 0 to 2 percent. Elevation is 1,875 to 2,000 feet.

This unit makes up about 1 percent of the survey area. It is about 45 percent Harlem and similar soils, 25 percent Havre and similar soils, and 10 percent Glendive and similar soils. The remaining 20 percent is components of minor extent.

Harlem soils are deep and well drained. They are moderately fine textured in the surface layer and fine textured in the underlying material. Havre soils are deep, well drained, and medium textured throughout. Glendive soils are deep, well drained, and moderately coarse textured throughout.

Of minor extent in this unit are Bowdoin, Lallie, Banks, and Harlem soils and Riverwash. The Bowdoin, Lallie, and Harlem soils are salt-affected. The Banks soils are droughty. Riverwash is subject to frequent periods of flooding, and it supports little or no vegetation.

This unit is used mainly for irrigated hay and cultivated crops. It is also used as rangeland, woodland, and wildlife habitat and for nonirrigated cultivated crops.

This unit has potential for providing habitat for white-tailed deer, ring-necked pheasant, gray partridge, sharp-tailed grouse, raccoon, and red fox.

The main limitation of this unit for homesite development is the slow permeability of the Harlem soil.

4. Lallie-Nobe-Lohler

Deep, nearly level, very poorly drained and moderately well drained soils that are subject to flooding

This map unit is mostly along the tributaries of the Missouri River. It is subject to flooding. Slope is 0 to 2 percent. Elevation is 1,875 to 2,900 feet.

This unit makes up about 4 percent of the survey area. It is about 25 percent Lallie and similar soils, 25 percent

Nobe and similar soils, and 10 percent Lohler and similar soils. The remaining 40 percent is components of minor extent.

Lallie soils are deep, very poorly drained, and fine textured throughout. They are moderately to strongly salt-affected. A seasonal high water table is between depths of 12 inches above the surface and 18 inches below the surface in April through June.

Nobe soils are deep and moderately well drained. They are strongly sodium- and salt-affected. They are medium textured in the upper 2 inches and fine textured in the underlying material.

Lohler soils are deep, moderately well drained, and fine textured throughout.

Of minor extent in this unit are Havrelon, Banks, Trembles, Farnuf, Cherry, and Farland soils; Fluvaquents, saline; Fluvaquents, ponded; Typic Ustifluvents; and Riverwash. The Havrelon and Trembles soils are deep and well drained. The Banks soils are deep and somewhat excessively drained. The Farnuf, Cherry, and Farland soils are deep and well drained. The Fluvaquents, saline, are erratically stratified with gravelly sand to clay. They are wet and salt-affected. The Fluvaquents, ponded, generally are too wet for most uses. The Typic Ustifluvents are erratically stratified with gravelly loamy sand to silty clay. Riverwash supports little or no vegetation.

This unit is used mainly as rangeland. It is also used for grass hay, nonirrigated cultivated crops, and wildlife habitat.

This unit has potential for providing habitat for white-tailed deer, mule deer, ring-necked pheasant, gray partridge, sharp-tailed grouse, red fox, coyote, and ducks and geese.

The main limitation of this unit for homesite development is the hazard of flooding.

Soils on moderately steep to steep uplands, terraces, and outwash plains

This group consists of five map units. It makes up about 23 percent of the survey area. The soils in this group are moderately steep to steep. Elevation is 2,000 to 3,100 feet.

The soils in this group are shallow to deep and are well drained and excessively drained. They formed in glacial till, outwash, consolidated shale, and weakly consolidated sedimentary beds.

This group is used mainly as rangeland. It is also used as a source of sand and gravel and as wildlife habitat.

The main limitation of this group for most uses is slope.

5. Wabek-Tinsley-Cabba

Shallow and deep, well drained and excessively drained, moderately steep to steep, droughty and very droughty soils; on terraces, outwash plains, and uplands

This map unit is mostly in Daniels County and the northwestern part of Roosevelt County. Slope is 15 to 45 percent. Elevation is 2,200 to 3,000 feet.

This unit makes up about 5 percent of the survey area. It is about 25 percent Wabek and similar soils, 15 percent Tinsley soils, and 15 percent Cabba soils. The remaining 45 percent is components of minor extent.

Wabek soils are deep and excessively drained. They formed in outwash and are on terraces and outwash plains. They are coarse textured and very droughty.

Tinsley soils are deep and excessively drained. They formed in outwash and are on terraces, knolls, and ridges. They are coarse textured and very droughty.

Cabba soils are shallow and well drained. They formed in material derived from weakly consolidated sedimentary beds and are on uplands. They are medium textured and are underlain by weakly consolidated sedimentary beds at a depth of 10 to 20 inches. These soils are droughty.

Of minor extent in this unit are Cambert, Beaverton, Tally, and Turner soils. The Cambert soils are well drained and moderately deep to weakly consolidated sedimentary beds. The Beaverton, Tally, and Turner soils are deep, well drained, and droughty.

This unit is used mainly as rangeland. It is also used as a source of sand and gravel and as wildlife habitat.

This unit has potential for providing habitat for white-tailed deer, mule deer, sharp-tailed grouse, red fox, and coyote.

The main limitation of this unit for homesite development is slope.

6. Cabba-Cambert-Rock outcrop

Shallow and moderately deep, well drained, moderately steep to steep soils, and Rock outcrop; on uplands

This map unit is mostly in the central part of Daniels County and the southeastern part of Roosevelt County. Slope is 15 to 45 percent. Elevation is 2,000 to 3,100 feet.

This unit makes up about 4 percent of the survey area. It is about 25 percent Cabba soils, 20 percent Cambert soils, and 15 percent Rock outcrop. The remaining 40 percent is components of minor extent.

Cabba soils are shallow. They formed in material derived from weakly consolidated sedimentary beds and are on uplands. These soils are medium textured and are underlain by sedimentary beds at a depth of 10 to 20 inches. The soils are droughty.

Cambert soils are moderately deep. They formed in material derived from weakly consolidated sedimentary beds and are on uplands. These soils are medium textured and are underlain by sedimentary beds at a depth of 20 to 36 inches. The soils are droughty.

Rock outcrop is areas of mainly steep and very steep, geologically eroded sedimentary beds that are soft and multicolored. The beds consist mainly of siltstone,

sandstone, and shale. Surface runoff is high. Areas of Rock outcrop support very little vegetation.

Of minor extent in this unit are Zahill, Zahl, Cherry, Farland, Farnuf, Wabek, and Tinsley soils and Badland. The Zahill, Zahl, Cherry, Farland, and Farnuf soils are deep and well drained. The Wabek and Tinsley soils are deep, excessively drained, coarse textured, and very droughty. Badland supports very little vegetation.

This unit is used mainly as rangeland. It is also used as wildlife habitat.

This unit has potential for providing habitat for mule deer, sharp-tailed grouse, and coyote.

The main limitation for homesite development is slope.

7. Zahill-Tinsley-Wabek

Deep, well drained and excessively drained, moderately steep to steep soils; on uplands, terraces, and outwash plains

This map unit is mostly in the western part of Roosevelt County and the southern part of Daniels County. Slope is 15 to 45 percent. Elevation is 2,000 to 3,000 feet.

This unit makes up about 6 percent of the survey area. It is about 75 percent Zahill soils, 10 percent Tinsley soils, and 5 percent Wabek soils. The remaining 10 percent is components of minor extent.

Zahill soils are deep and well drained and are calcareous throughout. They formed in glacial till and are on uplands. They are medium textured in the surface layer and moderately fine textured in the underlying material.

Tinsley soils are deep and excessively drained. They formed in outwash and are on terraces and uplands. They are coarse textured and very droughty.

Wabek soils are deep and excessively drained. They formed in outwash and are on terraces and outwash plains. They are coarse textured and very droughty.

Of minor extent in this unit are Cabba, Cambert, and Farnuf soils and Typic Ustifluvents. The Cabba soils are medium textured and are 10 to 20 inches deep to weakly consolidated sedimentary beds. The Cambert soils are medium textured and are 20 to 36 inches deep to weakly consolidated sedimentary beds. The Farnuf soils are deep and well drained. The Typic Ustifluvents are subject to flooding and are erratically stratified with gravelly loamy sand to silty clay.

This unit is used mainly as rangeland. It is also used as wildlife habitat.

This unit has potential for providing habitat for white-tailed deer, mule deer, sharp-tailed grouse, red fox, and coyote.

The main limitation for homesite development is slope.

8. Zahill-Cabba-Cambert

Shallow to deep, well drained, moderately steep to steep soils; on uplands

This map unit is mostly in the eastern part of Daniels County and in the central and eastern parts of Roosevelt County. Slope is 15 to 45 percent. Elevation is 2,000 to 3,000 feet.

This unit makes up about 7 percent of the survey area. It is about 55 percent Zahill soils, 15 percent Cabba soils, and 15 percent Cambert soils. The remaining 15 percent is components of minor extent.

Zahill soils are deep and are calcareous throughout. They formed in glacial till and are on uplands. They are medium textured in the surface layer and moderately fine textured in the underlying material.

Cabba soils are shallow. They formed in material derived from weakly consolidated sedimentary beds and are on uplands. They are medium textured and are underlain by weakly consolidated sedimentary beds at a depth of 10 to 20 inches. The soils are droughty.

Cambert soils are moderately deep. They formed in material derived from weakly consolidated sedimentary beds and are on uplands. They are medium textured and are underlain by weakly consolidated sedimentary beds at a depth of 20 to 36 inches. The soils are droughty.

Of minor extent in this unit are Tally, Zahl, Farland, Farnuf, and Cherry soils and Badland. The soils are deep and well drained. Badland supports very little vegetation.

This unit is used mainly as rangeland. It is also used as wildlife habitat.

This unit has potential for providing habitat for white-tailed deer, mule deer, sharp-tailed grouse, and coyote.

The main limitation of this unit for homesite development is slope.

9. Hillon-Tinsley-Thebo

Moderately deep and deep, well drained and excessively drained, moderately steep to steep soils; on uplands and terraces

This map unit is in the southwestern part of Roosevelt County. Slope is 15 to 45 percent. Elevation is 2,000 to 2,500 feet.

This unit makes up about 1 percent of the survey area. It is about 55 percent Hillon soils, 20 percent Tinsley soils, and 15 percent Thebo soils. The remaining 10 percent is components of minor extent.

Hillon soils are deep and well drained. They formed in glacial till and are on uplands. They are medium textured in the surface layer and moderately fine textured in the underlying material. The soils are calcareous throughout.

Tinsley soils are deep and excessively drained. They formed in outwash and are on terraces, knolls, and ridges. They are coarse textured and very droughty.

Thebo soils are moderately deep and well drained. They formed in material derived from consolidated shale and are on uplands. They are fine textured and are underlain by consolidated shale at a depth of 20 to 40 inches. The soils are droughty.

Of minor extent in this unit are Telstad, Evanston, Vanda Variant, Lisam, and Wabek soils and Ustic Torrifluvents. The Telstad and Evanston soils are deep and well drained. The Vanda Variant soils are deep, well drained, and salt-affected. The Lisam soils are shallow to consolidated shale. The Wabek soils are coarse textured and very droughty. The Ustic Torrifluvents are subject to flooding and are erratically stratified with gravelly loamy sand to silty clay.

This unit is used mainly as rangeland. It is also used as a source of sand and gravel and as wildlife habitat.

This unit has potential for providing habitat for white-tailed deer, mule deer, sharp-tailed grouse, red fox, and coyote.

The main limitation of this unit for homesite development is slope.

Soils on nearly level to strongly sloping uplands, fans, and terraces

This group consists of five map units. It makes up about 67 percent of the survey area. The soils in this group are nearly level to strongly sloping. Elevation is 1,900 to 3,100 feet.

The soils in this group are deep and well drained. They formed in glacial till, alluvium, outwash, and eolian deposits.

The soils are used mainly for nonirrigated cultivated crops and as rangeland. They are also used for alfalfa hay and grass-legume hay and as wildlife habitat.

10. Farland-Cherry-Farnuf

Deep, well drained, gently sloping to moderately sloping soils; on fans, terraces, and foot slopes

This map unit is throughout the survey area except in the southwestern part of Roosevelt County. Slope is 2 to 8 percent. Elevation is 1,900 to 3,000 feet.

This unit makes up about 7 percent of the survey area. It is about 40 percent Farland soils, 40 percent Cherry soils, and 10 percent Farnuf soils. The remaining 10 percent is components of minor extent.

Farland soils are deep and well drained. They formed in alluvium derived from sedimentary material. These soils are on fans and foot slopes. They are medium textured in the surface layer, moderately fine textured in the subsoil, and medium textured in the substratum.

Cherry soils are deep and well drained. They formed in alluvium derived from sedimentary material. These soils are on fans and foot slopes. They are medium textured throughout.

Farnuf soils are deep and well drained. They formed in alluvium and are on fans and terraces. These soils are medium textured in the surface layer, moderately fine textured in the subsoil and upper part of the substratum, and moderately coarse textured in the lower part of the substratum.

Of minor extent in this unit are Williams, Bowbells, Turner, Adger, Cabba, and Cambert soils. The Williams, Bowbells, and Turner soils are deep and well drained. The Adger soils are strongly sodium- and salt-affected. The Cabba soils are shallow to weakly consolidated sedimentary beds. The Cambert soils are moderately deep to weakly consolidated sedimentary beds.

This unit is used mainly for nonirrigated cultivated crops and as rangeland. It is also used for grass-legume hay and as wildlife habitat.

This unit has potential for providing habitat for white-tailed deer, mule deer, pronghorn antelope, sharp-tailed grouse, sage grouse, ring-necked pheasant, gray partridge, red fox, and coyote.

The main limitations of this unit for homesite development are restricted permeability, frost action potential, and shrink-swell potential.

11. Turner-Beaverton-Tally

Deep, well drained, nearly level to strongly sloping, droughty soils; on fans, terraces, and foot slopes

This map unit is in the northwestern part of Roosevelt County and in most of Daniels County. Slope is 0 to 15 percent. Elevation is 2,000 to 3,100 feet.

This unit makes up about 14 percent of the survey area. It is about 65 percent Turner soils, 10 percent Beaverton soils, and 5 percent Tally soils. The remaining 20 percent is components of minor extent.

Turner soils are deep and well drained. They formed in outwash and are on fans and terraces. They are droughty and have a moderately coarse textured surface layer, a medium textured subsoil, and a coarse textured substratum.

Beaverton soils are deep and well drained. They formed in outwash and are on terraces. They are droughty and have a moderately coarse textured surface layer, a medium textured subsoil, and a coarse textured substratum.

Tally soils are deep and well drained. They formed in alluvial and eolian deposits and are on terraces and foot slopes. They are droughty and are moderately coarse textured throughout.

Of minor extent in this unit are Martinsdale, Dooley, Parshall, Lihen, Tinsley, and Wabek soils. The Martinsdale soils formed in alluvium. The Dooley soils formed in glacial till. The Parshall soils formed in local alluvium and are in depressional areas on uplands. The Lihen, Tinsley, and Wabek soils are droughty.

This unit is used mainly for nonirrigated cultivated crops and as rangeland. It is also used for alfalfa hay, grass-legume hay, and wildlife habitat.

This unit has potential for providing habitat for white-tailed deer, mule deer, pronghorn antelope, sharp-tailed grouse, sage grouse, ring-necked pheasant, gray partridge, red fox, and coyote.

The main limitations of this unit for homesite development are shrink-swell potential, frost action potential, the tendency for cutbanks to cave in, and slope. Because the soils in this unit are highly permeable, effluent from septic tank absorption fields may contaminate ground water.

12. Williams-Zahill-Farnuf

Deep, well drained, nearly level to moderately sloping, moist soils; on uplands and fans

This map unit is throughout the survey area except in the southwestern part of Roosevelt County. Slope is 0 to 8 percent. Elevation is 2,000 to 3,000 feet.

This unit makes up about 40 percent of the survey area. It is about 45 percent Williams soils, 15 percent Zahill soils, 10 percent Farnuf soils, and 30 percent soils of minor extent (fig. 2).

Williams soils are deep and well drained. They formed in glacial till and are on uplands. These soils are nearly level to moderately sloping. They are medium textured in the surface layer and moderately fine textured in the subsoil and substratum.

Zahill soils are deep and well drained. They formed in glacial till and are on uplands. These soils are gently sloping to moderately sloping. They are medium textured in the surface layer and moderately fine textured in the substratum. They are calcareous throughout.

Farnuf soils are deep and well drained. They formed in alluvium and are on fans. These soils are gently sloping to moderately sloping. They are medium textured in the surface layer, moderately fine textured in the subsoil and upper part of the substratum, and moderately coarse textured in the lower part of the substratum.

Of minor extent in this unit are Nishon, Savage, Dooley, Bowbells, and Grail soils and Typic Ustifluvents. The Nishon soils are in small enclosed basins that are subject to ponding. The Savage soils are moderately fine textured in the surface layer and fine textured in the subsoil and substratum. The Dooley soils have a mantle of eolian or alluvial material overlying glacial till. The Bowbells soils are in drained depressional areas on uplands. The Grail soils are in depressional areas on uplands and are fine textured in the subsoil and substratum. The Typic Ustifluvents formed in deposits of recent alluvium and are subject to frequent periods of flooding.

This unit is used mainly for nonirrigated cultivated crops and as rangeland. It is also used for grass-legume hay and as wildlife habitat.

This unit has potential for providing habitat for white-tailed deer, mule deer, pronghorn antelope, sharp-tailed grouse, sage grouse, ring-necked pheasant, gray partridge, red fox, and coyote.

The main limitations of this unit for homesite development are restricted permeability, low soil strength, frost action potential, and shrink-swell potential.

13. Telstad-Hillon-Evanston

Deep, well drained, gently sloping to moderately sloping, dry soils; on uplands and fans

This map unit is in the southwestern part of Roosevelt County. Slope is 2 to 8 percent. Elevation is 2,000 to 2,500 feet.

This unit makes up about 1 percent of the survey area. It is about 55 percent Telstad soils, 25 percent Hillon soils, and 10 percent Evanston soils. The remaining 10 percent is components of minor extent.

Telstad soils are deep and well drained. They formed in glacial till and are on uplands. They are medium textured in the surface layer and moderately fine textured in the subsoil and substratum.

Hillon soils are deep and well drained. They formed in glacial till and are on uplands. They are medium textured in the surface layer and moderately fine textured in the substratum. These soils are calcareous throughout.

Evanston soils are deep and well drained. They formed in alluvium and are on fans. They are medium textured in the surface layer, moderately fine textured in the upper part of the subsoil, medium textured in the lower part of the subsoil and the upper part of the substratum, and moderately coarse textured in the lower part of the substratum.

Of minor extent in this unit are Phillips and Elloam soils. The Phillips soils are moderately fine textured and fine textured in the subsoil. The Elloam soils have a subsoil that is affected by sodium and salts.

This unit is used mainly for nonirrigated cultivated crops and as rangeland. It is also used as wildlife habitat.

This unit has potential for providing habitat for white-tailed deer, mule deer, pronghorn antelope, sharp-tailed grouse, sage grouse, ring-necked pheasant, gray partridge, red fox, and coyote.

The main limitations of this unit for homesite development are restricted permeability, low soil strength, frost action potential, and shrink-swell potential.

14. Dooley-Tally-Parshall

Deep, well drained, nearly level to moderately sloping soils; on uplands and terraces

This map unit is in the eastern part of Roosevelt County. Slope is 0 to 8 percent. Elevation is 2,000 to 3,000 feet.

This unit makes up about 5 percent of the survey area. It is about 60 percent Dooley soils, 25 percent Tally soils, and 5 percent Parshall soils. The remaining 10 percent is components of minor extent.

Dooley soils are deep and well drained. They formed in a mantle of eolian or alluvial material overlying glacial till. These soils are on uplands. They are nearly level to gently sloping. They have a moderately coarse textured

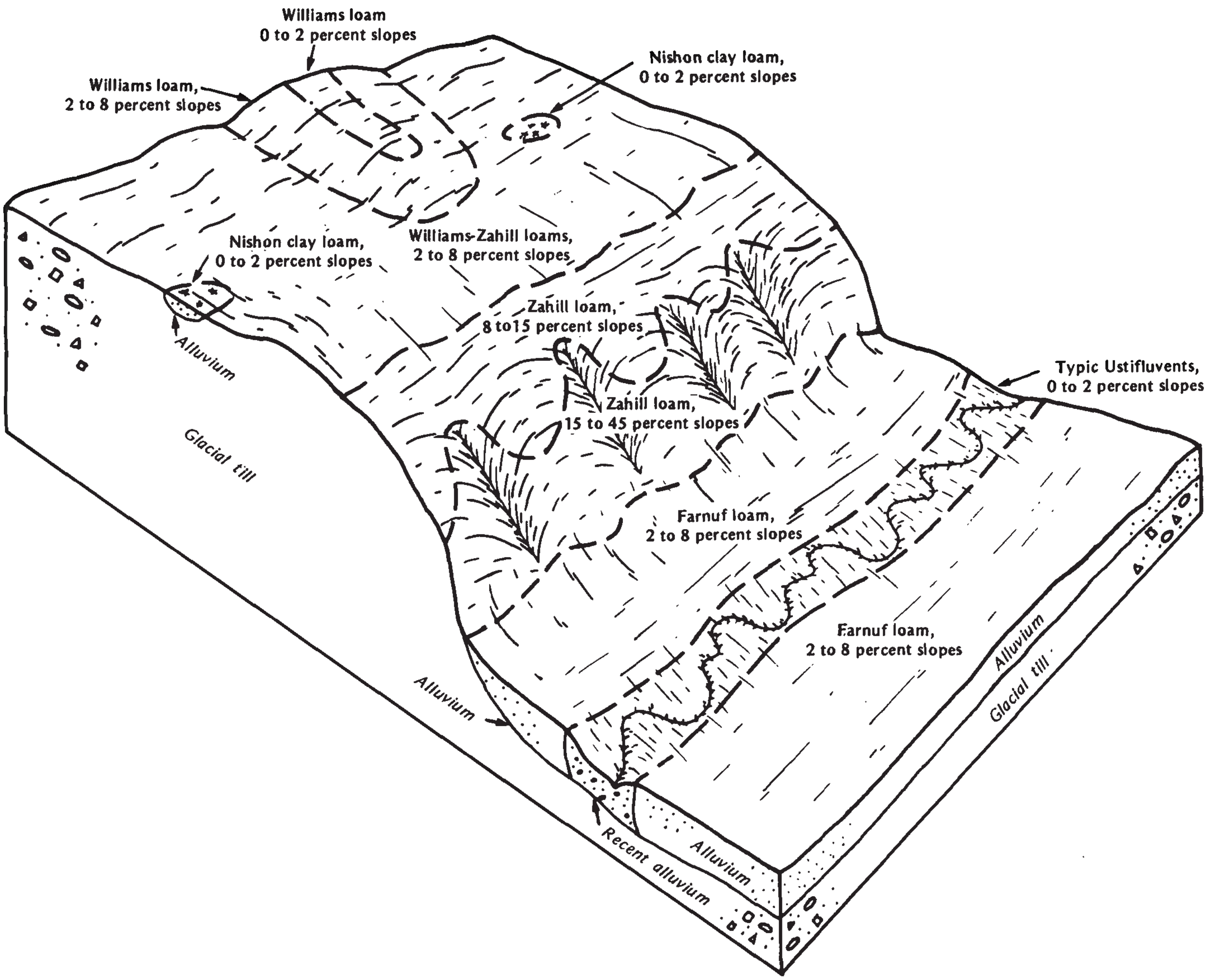


Figure 2.—Relationship of Williams, Zahill, Farnuf, and associated soils to parent material and topography.

surface layer, a medium textured subsoil, and a moderately fine textured substratum.

Tally soils are deep and well drained. They formed in alluvial and eolian deposits and are on terraces and foot slopes. These soils are gently sloping to moderately sloping. They are moderately coarse textured throughout and are droughty.

Parshall soils are deep and well drained. They formed in local alluvium and are in depressional areas on uplands. They are nearly level to gently sloping. These soils receive additional runoff from adjacent areas. They have a moderately coarse textured surface layer and subsoil and a coarse textured substratum.

Of minor extent in this unit are Blanchard, Lihen, Turner, Williams, and Farnuf soils, and a Parshall soil that has a silty substratum. The Blanchard, Lihen, and Turner soils are droughty. The Williams soils formed in glacial till. The Farnuf soils formed in alluvium and are on fans. Wetness of the Parshall soil in spring may interfere with tillage.

This unit is used mainly for nonirrigated cultivated crops. It is also used as rangeland and wildlife habitat and for grass hay.

This unit has potential for providing habitat for white-tailed deer, mule deer, pronghorn antelope, sharp-tailed

grouse, sage grouse, ring-necked pheasant, gray partridge, red fox, and coyote.

The main limitations of the Tally and Parshall soils for homesite development are the potential for frost action and the tendency for cutbanks to cave in. The main limitations of the Dooley soils for homesite development are slow permeability below a depth of about 23 inches, low soil strength, frost action potential, and shrink-swell potential.

Broad Land Use Considerations

The soils in this survey area vary widely in their potential for major land uses. Approximately 51 percent of the land in the area is used for cultivated crops. Spring wheat is the principal nonirrigated crop. Winter wheat, barley, alfalfa hay, grass-legume hay, and grass hay are other important nonirrigated crops. This nonirrigated cropland is scattered throughout the survey area, but it is concentrated largely in general soil map units 2, 10, 12, 13, and 14. The hazard of soil blowing is the major limitation for nonirrigated crops in each of these map units.

Approximately 20,000 acres in the survey area is used for irrigated crops. Alfalfa hay is the principal irrigated crop. Grass-legume hay, spring wheat, and corn for silage are other important irrigated crops. The irrigated cropland is scattered throughout the survey area, but it is concentrated largely in map units 1, 2, and 3. Land leveling is the main consideration for irrigated crops in each of these map units. The main soils in map units 1 and 2 are Havrelon, Lohler, and Trembles soils. The main soils in map unit 3 are Harlem, Havre, and Glendive soils.

Soils in map units 1 and 4 have limited potential for cultivated crops because of the hazard of flooding. Soils in map units 5, 6, 7, 8, and 9 are poorly suited to cultivated crops mainly because of moderately steep to steep slopes.

Approximately 49 percent of the land in the survey area is used as rangeland. The rangeland is scattered throughout the survey area, but it is concentrated largely in map units 1, 4, 5, 6, 7, 8, 9, and 11. The primary use of rangeland is for grazing domestic livestock. Proper grazing use, deferred grazing, and planned rotation grazing systems are the main considerations for managing the rangeland.

About 3,400 acres in this survey area is classified as urban or built-up land, and an additional 29,000 acres is dedicated to other uses such as roads and railroads. These areas are scattered throughout the areas of cropland and rangeland. The protected, nearly level Havrelon, Trembles, Havre, and Glendive soils generally are suited to urban uses. These soils are mainly in map units 2 and 3. Also, the nearly level to moderately sloping Turner, Tally, and Parshall soils are suited to urban uses. These soils are mainly in map units 11 and 14. Soils in map units 1 and 4 have low potential for urban development because of the hazard of flooding. Soils in map units 5, 6, 7, 8, and 9 have low potential because of moderately steep to steep slopes. In map units 10, 12, and 13, low soil strength, slow permeability, frost action potential, shrink-swell potential, and steepness of slope are the principal limitations. Sites that are suitable for houses or small commercial buildings, however, are generally available in areas of all of the map units.

Potential for wildlife habitat is generally high throughout the survey area. The soils on flood plains in map units 1 and 4 have high potential for habitat for wetland wildlife. The Lallie soils are especially suitable as shallow water areas for waterfowl. Most soils in the rest of the map units generally have high potential for habitat for openland and rangeland wildlife.

Detailed Soil Map Units

The map units delineated on the detailed maps at the back of this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit is given under "Use and Management of the Soils."

A map unit delineation on a map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils and miscellaneous areas have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit descriptions. Other included soils and miscellaneous areas, however, have properties and behavior divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation to precisely define and locate the soils and miscellaneous areas is needed.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying layers, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Zahill loam, 8 to 15 percent slopes, is one of several phases in the Zahill series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Thebo-Lisam complex, 15 to 45 percent slopes, is an example.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Riverwash is an example.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations,

capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

Map Unit Descriptions

1—Adger silty clay loam, 1 to 8 percent slopes. This deep, well drained, strongly sodium- and salt-affected soil is on fans and foot slopes on uplands. The soil is throughout the survey area except in the southwestern part of Roosevelt County. It formed in alluvium. Slope is 1 to 8 percent. Slopes are mainly 250 to 650 feet long. Elevation is 2,000 to 3,000 feet.

Included in this unit are small areas of Farnuf, Savage, Cherry, Farland, and Nobe soils. The Farnuf, Savage, Cherry, and Farland soils do not adversely affect the use and management of this unit as rangeland. The Nobe soil produces less vegetation than does the Adger soil.

Typically, the Adger soil, where mixed to a depth of 4 inches, has a surface layer of grayish brown silty clay. The subsoil to a depth of 8 inches is grayish brown silty clay. The substratum to a depth of 60 inches or more is light brownish gray silty clay.

Permeability is very slow, and available water capacity is moderate. Effective rooting depth is about 18 inches. Where this soil is under native vegetation, the average annual wetting depth is about 18 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. This soil is strongly sodium- and salt-affected at a depth of about 1 inch.

This soil is used mainly as rangeland.

Crop management.—This soil is poorly suited to cultivated crops. It is limited mainly by the content of sodium and salts.

Range management.—The potential plant community is mainly green needlegrass, western wheatgrass, Nuttall saltbush, and Montana wheatgrass. If the range is excessively grazed, these plants decrease and plains reedgrass, blue grama, Sandberg bluegrass, and greasewood increase. If excessive grazing continues, plants such as bottlebrush squirreltail, plains pricklypear, annuals, and weedlike forbs may invade. The potential plant community will produce about 900 pounds of air-dry vegetation per acre in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This soil is poorly suited to windbreaks because it is strongly sodium- and salt-affected.

Homesite development.—If this soil is used for homesite development, it is limited mainly by the very slow permeability, shrink-swell potential, and low soil strength. If buildings are constructed on this soil, properly design foundations and footings and divert runoff away from buildings to help prevent structural damage as a result of shrinking and swelling. If the soil is used for septic tank absorption fields, the limitation of very slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass VIs, nonirrigated. It is in Dense Clay range site, 10- to 14-inch precipitation zone.

2—Adger-Farnuf complex, 1 to 8 percent slopes. This map unit is on fans and foot slopes on uplands. It is throughout the survey area except in the southwestern part of Roosevelt County. Slope is 1 to 8 percent. Slopes are mainly 300 to 700 feet long. Elevation is 2,000 to 3,000 feet.

This unit is about 50 percent Adger silty clay loam and 40 percent Farnuf loam. The Adger soil is in the less sloping areas of the unit, and the Farnuf soil is in the steeper areas.

Included in this unit are small areas of Farland, Cherry, Savage, and Nobe soils. Included areas make up about 10 percent of the total acreage. The Farland, Cherry, and Savage soils do not adversely affect the use and management of this unit as rangeland. The Nobe soil produces less vegetation than the Adger and Farnuf soils.

The Adger soil is deep and well drained. It formed in alluvium and is strongly sodium- and salt-affected. Typically, the Adger soil, where mixed to a depth of 4 inches, has a surface layer of grayish brown silty clay loam. The subsoil to a depth of 8 inches is grayish brown silty clay. The substratum to a depth of 60 inches or more is light brownish gray silty clay.

Permeability is very slow, and available water capacity is moderate. Effective rooting depth is about 18 inches. Where this soil is under native vegetation, the average annual wetting depth is about 18 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Farnuf soil is deep and well drained. It formed in alluvium. Typically, the Farnuf soil, where mixed to a depth of 7 inches, has a surface layer of brown loam. The upper 11 inches of the subsoil is yellowish brown clay loam, and the lower 4 inches is pale brown silt loam. The upper 14 inches of the substratum is very pale brown silty clay loam, and the lower part to a depth of 60 inches or more is light brownish gray sandy loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used mainly as rangeland.

Crop management.—This unit is poorly suited to cultivated crops. It is limited mainly by the strongly sodium- and salt-affected Adger soil.

Range management.—The potential plant community on the Adger soil is mainly green needlegrass, western wheatgrass, Nuttall saltbush, and Montana wheatgrass. If the range is excessively grazed, these plants decrease and plains reedgrass, blue grama, Sandberg bluegrass, and greasewood increase. If excessive grazing continues, plants such as bottlebrush squirreltail, plains pricklypear, annuals, and weedlike forbs may invade. The potential plant community will produce about 900 pounds of air-dry vegetation per acre in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

The potential plant community on the Farnuf soil is mainly green needlegrass, western wheatgrass, needleandthread, and winterfat. If the range is excessively grazed, green needlegrass, western wheatgrass, and winterfat decrease and needleandthread, little porcupinegrass, blue grama, junegrass, perennial forbs, and fringed sagewort increase. If excessive grazing continues, plants such as cheatgrass, sixweeks fescue, clubmoss, and weedlike forbs may invade. The potential plant community will produce about 1,800 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,100 pounds in years of below-normal precipitation.

This unit is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—The Adger soil is poorly suited to windbreaks because it is strongly sodium- and salt-affected. The Farnuf soil is suited to windbreaks. Suitable trees for planting are Siberian elm, Russian-olive, Rocky Mountain juniper, cottonwood, and ponderosa pine. Suitable shrubs are Siberian peashrub, American plum, Tatarian honeysuckle, and silver buffaloberry.

Homesite development.—If this unit is used for homesite development, it is limited mainly by the very slow permeability of the Adger soil and by shrink-swell potential, frost action, and low soil strength. If buildings are constructed on this unit, properly design foundations and footings and divert runoff away from buildings to help prevent structural damage as a result of shrinking and swelling. If the Adger soil is used for septic tank absorption fields, the limitation of very slow permeability can be overcome by increasing the size of the absorption field. The low strength of the Adger soil and the frost action of the Farnuf soil can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass VIs, nonirrigated. The Adger soil is in Dense Clay range site, 10- to 14-inch precipitation zone, and the Farnuf soil is in Silty range site, 10- to 14-inch precipitation zone.

3—Adger-Nobe complex, 1 to 4 percent slopes. This map unit is on fans and foot slopes. It is throughout the survey area except in the southwestern part of Roosevelt County. Slope is 1 to 4 percent. Slopes are mainly 250 to 650 feet long. Elevation is 2,000 to 3,000 feet.

This unit is about 50 percent Adger silty clay loam and 40 percent Nobe silty clay.

Included in this unit are small areas of Farnuf, Cherry, and Farland soils. Included areas make up about 10 percent of the total acreage. These included soils do not adversely affect the use and management of this unit as rangeland.

The Adger soil is deep and well drained. It formed in alluvium and is strongly sodium- and salt-affected. Typically, the surface layer, where mixed to a depth of 4 inches, is grayish brown silty clay loam. The subsoil to a depth of 8 inches is grayish brown silty clay. The substratum to a depth of 60 inches or more is light brownish gray silty clay.

Permeability is very slow, and available water capacity is moderate. Effective rooting depth is about 18 inches. Where this soil is under native vegetation, the average annual wetting depth is about 18 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Nobe soil is deep and moderately well drained. It formed in alluvium. It has a strongly sodium-affected subsoil and is strongly saline below about 5 inches. Typically, the surface layer, where mixed to a depth of 7 inches, is grayish brown silty clay. The substratum to a depth of 60 inches or more is grayish brown silty clay.

Permeability is very slow, and available water capacity is moderate. Effective rooting depth is about 10 inches. Where this soil is under native vegetation, the average annual wetting depth is about 18 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used mainly as rangeland.

Crop management.—This unit is poorly suited to cultivated crops. It is limited mainly by the content of sodium and salts in the soils.

Range management.—The potential plant community on the Adger soil is mainly green needlegrass, western wheatgrass, Nuttall saltbush, and Montana wheatgrass. the range is excessively grazed, these plants decrease and plains reedgrass, blue grama, Sandberg bluegrass, and greasewood increase. If excessive grazing continues, plants such as bottlebrush squirreltail, plains pricklypear, annuals, and weedlike forbs may invade. The

potential plant community will produce about 900 pounds of air-dry vegetation per acre in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

The potential plant community on the Nobe soil is mainly western wheatgrass, alkali sacaton, Nuttall alkaligrass, and Nuttall saltbush. If the range is excessively grazed, these plants decrease and inland saltgrass, bottlebrush squirreltail, and greasewood increase. If excessive grazing continues, plants such as plains pricklypear, foxtail barley, and weedlike forbs may invade. The potential plant community will produce about 500 pounds of air-dry vegetation per acre in years of above-normal precipitation and 200 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice on this unit.

Windbreak management.—This unit is poorly suited to windbreaks because of the content of salts and sodium in the soils.

Homesite development.—This unit is poorly suited to homesite development. It is limited mainly by shrink-swell potential, very slow permeability, and low soil strength. If buildings are constructed on this unit, properly design foundations and footings and divert runoff away from buildings to help prevent structural damage as a result of shrinking and swelling. If the unit is used for septic tank absorption fields, the limitation of very slow permeability can be overcome by increasing the size of the absorption field. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome this limitation.

This map unit is in capability subclass VIs, nonirrigated. The Adger soil is in Dense Clay range site, 10- to 14-inch precipitation zone, and the Nobe soil is in Saline Upland range site, 10- to 14-inch precipitation zone.

4—Badland. This unit consists of moderately steep, steep, and very steep knolls, ridges, and side slopes on uplands. It is throughout the survey area. It is nearly barren or barren and has numerous deeply entrenched intermittent drainageways. Badland was formed by the active geologic erosion of soft, multicolored sedimentary beds that are mainly sandstone, siltstone, and shale. Slope is 15 to 75 percent. Slopes are mainly 50 to 500 feet long. Elevation is 2,000 to 3,000 feet.

Included in this unit are small areas of Adger, Wabek, Tinsley, Zahill, Nobe, Cabba, and Cambert soils. These included soils are capable of producing a significant amount of forage.

Runoff is very rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This map unit is in capability subclass VIIIe.

5—Banks loam, 0 to 2 percent slopes. This deep, somewhat excessively drained, droughty soil is on the flood plain immediately adjacent to the Missouri River and on the flood plains of the tributaries of the Missouri River. It formed in alluvium and is subject to frequent periods of flooding. Slope is 0 to 2 percent. Slopes are mainly 25 to 300 feet long. Elevation is 1,875 to 2,500 feet.

Included in this unit are small areas of Trembles, Glendive, Havrelon, and Havre soils. These soils do not adversely affect the use and management of this unit for cultivated crops. Also included are small areas of Typic Ustifluvents. The Typic Ustifluvents are poorly suited to cultivated crops because of the variability in their textures.

Typically, the Banks soil has a surface layer of grayish brown loam 12 inches thick. The upper 8 inches of the underlying material is light brownish gray loamy fine sand, the next 20 inches is light yellowish brown fine sand and a few thin strata of fine sandy loam, and the lower part to a depth of 60 inches or more is light yellowish brown sand.

Permeability is rapid, and available water capacity is low. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 55 inches. Runoff is very slow, and the hazard of water erosion is high. The hazard of soil blowing is moderate. This soil is subject to flooding during prolonged, high intensity storms. Channeling and deposition are common along streambanks. The soil is subject to frequent periods of flooding from April through June.

Most areas of this soil are used as rangeland. A few areas are used for nonirrigated grass-legume hay.

Crop management.—This soil is poorly suited to cultivated crops. It is limited mainly by droughtiness and flooding in spring.

Range management.—The potential plant community is mainly prairie sandreed, green needlegrass, western wheatgrass, and winterfat. If the range is excessively grazed, these plants decrease and needleandthread, fringed sagewort, and silver sagebrush increase. If excessive grazing continues, plants such as Kentucky bluegrass, Canada bluegrass, and weedlike forbs may invade. The potential plant community will produce about 2,400 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,400 pounds in years of below-normal precipitation. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub and silver buffaloberry. The risk of soil blowing can be reduced by cultivating only between the rows of windbreaks.

Homesite development.—This soil is poorly suited to homesite development mainly because of the frequent periods of flooding in spring.

This map unit is in capability subclass IVw, nonirrigated. It is in Overflow range site, 10- to 14-inch precipitation zone.

6—Blanchard loamy fine sand, 4 to 25 percent slopes. This deep, excessively drained, droughty soil is on dunes on uplands. It is mostly in the eastern and central parts of Roosevelt County and in the southwestern part of Daniels County. It formed in eolian sand. Slope is 4 to 25 percent. Slopes are mainly 50 to 250 feet long. Elevation is 2,400 to 3,100 feet.

Included in this unit are small areas of Tally, Parshall, and Lihen soils. These areas do not adversely affect the use and management of this unit as rangeland.

Typically, the Blanchard soil has a surface layer of brown loamy fine sand 4 inches thick. The upper 20 inches of the substratum is light olive brown loamy sand, and the lower part to a depth of 60 inches or more is light yellowish brown fine sand.

Permeability is rapid, and available water capacity is low. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This soil is used mainly as rangeland.

Crop management.—This soil is poorly suited to cultivated crops. It is limited mainly by droughtiness, poor soil tilth, and the hazard of soil blowing.

Range management.—The potential plant community is mainly prairie sandreed, needleandthread, sand bluestem, and little bluestem. If the range is excessively grazed, prairie sandreed, sand bluestem, and little bluestem decrease and needleandthread, sand dropseed, blue grama, fringed sagewort, and red threeawn increase. If excessive grazing continues, plants such as plains pricklypear, annual bromes, and weedlike forbs may invade. The potential plant community will produce about 1,500 pounds of air-dry vegetation per acre in years of above-normal precipitation and 600 pounds in years of below-normal precipitation.

This soil is susceptible to soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. The less sloping areas are suitable for seeding to native or adapted forage species.

Windbreak management.—This soil is poorly suited to windbreaks because of the low available water capacity and steepness of slope in many areas.

Homesite development.—If this soil is used for homesite development, it is limited mainly by rapid permeability, susceptibility to slumping, and steepness of slope in many areas. Cutbanks are not stable and are subject to slumping. Because this soil is rapidly permeable, effluent from septic tank absorption fields may contaminate ground water.

This map unit is in capability subclass VIe, nonirrigated. It is in Sands range site, 10- to 14-inch precipitation zone.

7—Bowbells silt loams, 0 to 4 percent slopes. This map unit is in drained depressional areas on uplands. It is throughout the survey area except in the southwestern part of Roosevelt County. Slope is 0 to 4 percent. Slopes are mainly 100 to 200 feet long. Elevation is 2,000 to 3,000 feet.

This unit is about 45 percent Bowbells silt loam and 45 percent Bowbells silt loam, sandy substratum.

Included in this unit are small areas of Williams, Parshall, Farnuf, Nishon, and Grail soils. Included areas make up about 10 percent of the total acreage. The Williams, Parshall, Farnuf, and Grail soils do not adversely affect the use and management of this unit for most nonirrigated cultivated crops. The Nishon soil is ponded in spring, which restricts the use of equipment.

The Bowbells silt loam is deep and moderately well drained. It formed in glacial till. Typically, the surface layer is dark grayish brown silt loam 5 inches thick. The subsoil is dark grayish brown silty clay loam 18 inches thick. The upper 23 inches of the substratum is dark grayish brown silty clay loam, and the lower part to a depth of 60 inches or more is light brownish gray clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 45 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Bowbells silt loam, sandy substratum, is deep and well drained. It formed in local alluvium. Typically, the surface layer is dark grayish brown silt loam 7 inches thick. The subsoil is 30 inches thick. The upper 13 inches of the subsoil is dark grayish brown silty clay loam, and the lower 17 inches is light brownish gray loam and clay loam. The upper 8 inches of the substratum is grayish brown fine sandy loam, and the lower part to a depth of 60 inches or more is pale brown loamy fine sand.

Permeability is moderately slow to a depth of 45 inches and moderately rapid below this depth. Available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 45 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used mainly for nonirrigated cultivated crops, for grass hay, and as rangeland. The main nonirrigated crops are spring wheat, winter wheat, and barley.

Crop management.—This unit is well suited to nonirrigated cultivated crops. It is limited mainly by the hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. This unit produces high yields of nonirrigated cultivated crops because of the additional runoff water received from adjacent areas. It can be cropped annually.

Range management.—The potential plant community is mainly western wheatgrass, bluebunch wheatgrass, green needlegrass, and winterfat. If the range is excessively grazed, these plants decrease and needleandthread, little porcupinegrass, blue grama, and junegrass increase. If excessive grazing continues, plants such as cheatgrass, sixweeks fescue, clubmoss, and weedlike forbs may invade. The potential plant community will produce about 3,700 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,900 pounds in years of below-normal precipitation. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.— This unit is well suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, green ash, ponderosa pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, common chokecherry, silver buffaloberry, and Nanking cherry.

Homesite development.—If this unit is used for homesite development, it is limited mainly by shrink-swell potential, restricted permeability, frost action, and low soil strength. If buildings are constructed on this unit, properly design foundations and footings and divert runoff away from buildings to help prevent structural damage as a result of shrinking and swelling. Restricted permeability is a concern in installing septic tank absorption fields. The limitation of restricted permeability can be overcome by increasing the size of the absorption field. Low soil strength and frost action can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Overflow range site, 10- to 14-inch precipitation zone.

8—Bowdoin clay, protected, 0 to 2 percent slopes. This deep, well drained or moderately well drained, sodium- and salt-affected soil is on the Missouri River flood plain. It is on the parts of the flood plain that are protected from flooding by Fort Peck Dam. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly more than 1,000 feet long. Elevation is 1,875 to 2,000 feet.

Included in this unit are small areas of Harlem, Havre, Havrelon, and Lohler soils that are protected. Also included are small areas of Bowdoin soils that have a surface layer as coarse textured as silt loam because of the land-leveling practices used. These areas do not adversely affect the use and management of this unit as rangeland. Also included in the unit are small areas of Lallie soils that are subject to flooding and have a seasonal high water table at a depth of 0 to 18 inches from September through June. The Lallie soils are in depressional areas.

Typically, the Bowdoin soil is light brownish gray clay to a depth of 60 inches or more.

Permeability is very slow. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is strongly sodium-affected and moderately salt-affected at a depth of about 3 inches.

This soil is used mainly as rangeland.

Crop management.—This soil is poorly suited to cultivated crops. It is limited mainly by the content of sodium and salts and the clayey texture of the soil. The soil becomes very hard when dry. The salts in the soil reduce the amount of moisture available for plant growth.

Range management.—The potential plant community is mainly western wheatgrass, green needlegrass, Nuttall saltbush, and winterfat. If the range is excessively grazed, these plants decrease and plains reedgrass, blue grama, Sandberg bluegrass, and greasewood increase. If excessive grazing continues, plants such as bottlebrush squirreltail, plains pricklypear, annuals, and weedlike forbs may invade. The potential plant community will produce about 1,000 pounds of air-dry vegetation per acre in years of above-normal precipitation and 600 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses is a suitable practice. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure.

Windbreak management.—This soil is poorly suited to windbreaks because of the clayey texture, which restricts root development, and the content of sodium and salts.

Homesite development.—If this soil is used for homesite development, it is limited mainly by the very slow permeability, shrink-swell potential, low soil strength, and susceptibility to slumping. If the soil is used for septic tank absorption fields, the limitation of very slow permeability can be overcome by increasing the size of the absorption field. The field should be backfilled with gravel. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass VIs, nonirrigated. It is in Dense Clay range site, 10- to 14-inch precipitation zone.

9—Cabba-Cambert silt loams, 15 to 45 percent slopes. This map unit is on uplands, mostly in the eastern half of Roosevelt County and in most of Daniels County. Slope is 15 to 45 percent. Slopes are mainly 50 to 400 feet long. Elevation is 2,000 to 3,100 feet.

This unit is about 60 percent Cabba silt loam and 25 percent Cambert silt loam. The Cabba soil is in the steeper areas of the unit, and the Cambert soil is in the less sloping areas.

Included in this unit are small areas of Zahill, Cherry, Tinsley, and Wabek soils and alluvial soils, in drainageways, that have a thicker and darker colored surface layer than the Cabba and Cambert soils. Also included are small areas of Cabba and Cambert soils that have slopes of less than 15 percent and small areas of Rock outcrop. Included areas make up about 15 percent of the total acreage. The included soils do not adversely affect the use and management of this unit as rangeland. The areas of Rock outcrop produce very little vegetation.

The Cabba soil is shallow, well drained, and droughty. It formed in material derived from weakly consolidated sedimentary beds. Typically, the surface layer is light brownish gray silt loam 5 inches thick. The underlying material to a depth of 18 inches is light brownish gray silt loam. Below this to a depth of 60 inches or more are weakly consolidated sedimentary beds. Weakly consolidated sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low to low. Effective rooting depth is limited by the weakly consolidated sedimentary beds at a depth of about 18 inches. Where this soil is under native vegetation, the average annual wetting depth is about 18 inches. Runoff is rapid to very rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

The Cambert soil is moderately deep, well drained, and droughty. It formed in material derived from weakly consolidated sedimentary beds. Typically, the surface layer is brown silt loam 4 inches thick. The subsoil is pale brown silt loam 20 inches thick. The substratum is pale yellow silt loam 6 inches thick. Below this to a depth of 60 inches or more are pale yellow, weakly consolidated sedimentary beds. Weakly consolidated sedimentary beds are at a depth of 20 to 36 inches.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is limited by the weakly consolidated sedimentary beds at a depth of about 30 inches. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is rapid to very rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

This unit is used mainly as rangeland.

Crop management.—This unit is poorly suited to cultivated crops. It is limited mainly by moderately steep to steep slopes, droughtiness, and the hazards of water erosion and soil blowing.

Range management.—The potential plant community on the Cabba soil is mainly little bluestem, sideoats grama, green needlegrass, and plains muhly. If the range is excessively grazed, these plants decrease and needleandthread, blue grama, junegrass, Sandberg bluegrass, and fringed sagewort increase. If excessive grazing continues, plants such as broom snakeweed, annuals, and weedlike forbs may invade. The potential plant community will produce about 700 pounds of air-dry vegetation per acre in years of above-normal precipitation and 300 pounds in years of below-normal precipitation.

The potential plant community on the Cambert soil is mainly little bluestem, plains muhly, western wheatgrass, and green needlegrass. If the range is excessively grazed, these plants decrease and needleandthread, little porcupinegrass, blue grama, junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as broom snakeweed, weedlike forbs, and clubmoss may invade. The potential plant community will produce about 800 pounds of air-dry vegetation per acre in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas. Trails or walkways can be constructed to encourage livestock grazing in areas where access is limited. The Cabba soil produces less vegetation than the Cambert soil. The included alluvial soils produce a significant amount of the total forage on this unit.

Windbreak management.—This unit is poorly suited to windbreaks. It is limited mainly by steepness of slope.

Homesite development.—The main limitation of this unit for homesite development is steepness of slope.

This map unit is in capability subclass VIe, nonirrigated. The Cabba soil is in Shallow range site, 10- to 14-inch precipitation zone, and the Cambert soil is in Thin Hilly range site, 10- to 14-inch precipitation zone.

10—Cabba-Cambert-Cherry silt loams, 8 to 15 percent slopes. This map unit is on fans and foot slopes of uplands, mostly in the eastern half of Roosevelt County and in most of Daniels County. Slope is 8 to 15 percent. Slopes are mainly 100 to 400 feet long. Elevation is 2,000 to 3,000 feet.

This unit is about 35 percent Cabba silt loam, 30 percent Cambert silt loam, and 25 percent Cherry silt loam. The Cabba soil is in the steeper areas, and the Cambert and Cherry soils are in the less sloping areas.

Included in the mapped areas of this unit are small areas of Farland, Zahl, and Zahill soils. These soils do

not adversely affect the use and management of this unit for nonirrigated cultivated crops. Also included are small areas of Cabba, Cambert, and Cherry soils that have slopes of more than 15 percent and small areas of Rock outcrop. Included areas make up about 10 percent of the total acreage.

The Cabba soil is shallow, well drained, and droughty. It formed in material derived from weakly consolidated sedimentary beds. Typically, the surface layer is light brownish gray silt loam 5 inches thick. The underlying material to a depth of 18 inches is light brownish gray silt loam. Below this to a depth of 60 inches or more are weakly consolidated sedimentary beds. Weakly consolidated sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low to low. Effective rooting depth is limited by the weakly consolidated sedimentary beds at a depth of about 18 inches. Where this soil is under native vegetation, the average annual wetting depth is about 18 inches. Runoff is medium to rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

The Cambert soil is moderately deep, well drained, and droughty. It formed in material derived from weakly consolidated sedimentary beds. Typically, the surface layer is brown silt loam 4 inches thick. The subsoil is pale brown silt loam 20 inches thick. The substratum is pale yellow silt loam 6 inches thick. Below this to a depth of 60 inches or more are weakly consolidated sedimentary beds. Weakly consolidated sedimentary beds are at a depth of 20 to 36 inches.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is limited by the weakly consolidated sedimentary beds at a depth of about 30 inches. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is medium to rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The Cherry soil is deep and well drained. It formed in alluvium derived from sedimentary beds. Typically, the surface layer is grayish brown silt loam 4 inches thick. The subsoil is brown and very pale brown silt loam 24 inches thick. The substratum to a depth of 60 inches or more is very pale brown silt loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is medium to rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This unit is used mainly for nonirrigated cultivated crops and as rangeland. The main nonirrigated crops are spring wheat and barley.

Crop management.—This unit is poorly suited to nonirrigated cultivated crops. It is limited mainly by the hazards of water erosion and soil blowing and the droughtiness of the Cabba and Cambert soils. Additions of barnyard manure improve the available water capacity. Plowing the Cabba soil to a depth of about 2 to 3 feet also increases the available water capacity. All tillage should be on the contour or across the slope. Minimum tillage, contour cultivation, grassed waterways, and stubble mulch tillage reduce soil blowing and water erosion.

Range management.—The potential plant community on the Cabba soil is mainly little bluestem, western wheatgrass, green needlegrass, and plains muhly. If the range is excessively grazed, these plants decrease and needleandthread, blue grama, junegrass, Sandberg bluegrass, and fringed sagewort increase. If excessive grazing continues, plants such as broom snakeweed, annuals, and weedlike forbs may invade. The potential plant community will produce about 800 pounds of air-dry vegetation per acre in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

The potential plant community on the Cambert and Cherry soils is mainly little bluestem, needleandthread, western wheatgrass, and green needlegrass. If the range is excessively grazed, little bluestem, western wheatgrass, and green needlegrass decrease and needleandthread, little porcupinegrass, blue grama, junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as cheatgrass, sixweeks fescue, weedlike forbs, and clubmoss may invade. The potential plant community on the Cambert soil produces about 1,000 pounds of air-dry vegetation per acre in years of above-normal precipitation and 600 pounds in years of below-normal precipitation. The potential plant community on the Cherry soil produces about 1,400 pounds of air-dry vegetation per acre in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The surface layer of the soils in this unit is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. The Cabba soil produces less vegetation than the Cambert and Cherry soils.

Windbreak management.—The Cabba soil is poorly suited to windbreaks because of the very low to low available water capacity. The Cambert and Cherry soils are suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, Rocky Mountain juniper, ponderosa pine, and blue spruce. Suitable shrubs are Siberian peashrub and common chokecherry. The risk of soil blowing can be reduced by cultivating only between the rows of windbreaks.

Homesite development.—If this unit is used for homesite development, it is limited mainly by the restricted permeability of the underlying sedimentary beds in the Cabba and Cambert soils, the moderately

slow permeability of the Cherry soil, slope, frost action, and low soil strength. Increasing the size of septic tank absorption fields helps to compensate for the restricted permeability of the underlying sedimentary beds in the Cabba and Cambert soils and the moderately slow permeability of the Cherry soil. The steepness of slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Effluent from absorption fields can surface in downslope areas and create a hazard to health. Low soil strength and frost action can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IVe, nonirrigated. The Cambert soil is in Silty range site, 10- to 14-inch precipitation zone; the Cabba soil is in Shallow range site, 10- to 14-inch precipitation zone; and the Cherry soil is in Silty range site, 10- to 14-inch precipitation zone.

11—Cabba-Cambert-Rock outcrop complex, 15 to 45 percent slopes. This map unit is on foot slopes of uplands, mostly in the eastern half of Roosevelt County and in most of Daniels County. Slope is 15 to 45 percent. Slopes are mainly 50 to 400 feet long. Elevation is 2,000 to 3,100 feet.

This unit is about 40 percent Cabba silt loam, 30 percent Cambert silt loam, and 20 percent Rock outcrop. Rock outcrop is in the steeper areas of this unit, and the Cabba and Cambert soils are in the less sloping areas.

Included in this unit are small areas of Zahill, Wabek, Tinsley, and Cherry soils and alluvial soils, in drainageways, that have a thicker and darker colored surface layer than the Cabba and Cambert soils. Also included are small areas of Cabba and Cambert soils that have slopes of less than 15 percent. Included areas make up about 10 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland.

The Cabba soil is shallow, well drained, and droughty. It formed in material derived from weakly consolidated sedimentary beds. Typically, the surface layer is light brownish gray silt loam 5 inches thick. The underlying material is light brownish gray silt loam 13 inches thick. Below this to a depth of 60 inches or more are light brownish gray, weakly consolidated sedimentary beds. Weakly consolidated sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low to low. Effective rooting depth is limited by the weakly consolidated sedimentary beds at a depth of about 18 inches. Where this soil is under native vegetation, the average annual wetting depth is about 18 inches. Runoff is rapid to very rapid, and hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

The Cambert soil is moderately deep, well drained, and droughty. It formed in material derived from weakly consolidated sedimentary beds. Typically, the surface layer is brown silt loam 4 inches thick. The subsoil is pale brown silt loam 20 inches thick. The substratum is pale yellow silt loam 6 inches thick. Below this to a depth of 60 inches or more are weakly consolidated sedimentary beds. Weakly consolidated sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is limited by the weakly consolidated sedimentary beds at a depth of about 30 inches. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is rapid to very rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

Rock outcrop consists of areas of geologically eroded, soft, multicolored sedimentary beds that are mostly siltstone, sandstone, and shale. Surface runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used mainly as rangeland.

Crop management.—This unit is poorly suited to cultivated crops. It is limited mainly by steepness of slope, the hazard of water erosion, and the areas of Rock outcrop.

Range management.—The potential plant community on the Cabba soil is mainly little bluestem, sideoats grama, green needlegrass, and plains muhly. If the range is excessively grazed, these plants decrease and needleandthread, blue grama, junegrass, Sandberg bluegrass, and fringed sagewort increase. If excessive grazing continues, plants such as broom snakeweed, annuals, and weedlike forbs may invade. The potential plant community will produce about 700 pounds of air-dry vegetation per acre in years of above-normal precipitation and 300 pounds in years of below-normal precipitation.

The potential plant community on the Cambert soil is mainly little bluestem, plains muhly, western wheatgrass, and green needlegrass. If the range is excessively grazed, these plants decrease and needleandthread, little porcupinegrass, blue grama, junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as broom snakeweed, weedlike forbs, and clubmoss may invade. The potential plant community will produce about 800 pounds of air-dry vegetation per acre in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

The Cabba soil produces less vegetation than the Cambert soil. The areas of Rock outcrop produce very little forage. Mechanical treatment practices are not practical. The included alluvial soils produce a significant amount of the total forage on this unit.

Windbreak management.—This unit is poorly suited to windbreaks. It is limited mainly by steepness of slope.

Homesite development.—The main limitation of this unit for homesite development is steepness of slope.

This map unit is in capability subclass VIIe, nonirrigated. The Cabba soil is in Shallow range site, 10- to 14-inch precipitation zone, and the Cambert soil is in Thin Hilly range site, 10- to 14-inch precipitation zone.

12—Cherry silt loam, 2 to 8 percent slopes. This deep, well drained soil is on fans and foot slopes. It formed in alluvium derived dominantly from sedimentary material. It is mainly in the eastern half of Roosevelt County and in most of Daniels County. Slope is 2 to 8 percent. Slopes are mainly 250 to 800 feet long. Elevation is 1,900 to 3,000 feet.

Included in this unit are small areas of Cambert, Cabba, Farland, and Farnuf soils. Also included are small areas of Cherry soils that have slopes of more than 8 percent. The Cambert, Farland, and Farnuf soils do not adversely affect the use and management of this unit for nonirrigated cultivated crops. The small areas of Cherry soils that have slopes of more than 8 percent need careful management because the hazard of water erosion is high. These soils should be farmed on the contour. The Cabba soils are commonly in the steeper areas. These Cabba soils have a shallow effective rooting depth. They should be farmed on the contour because of the high hazard of water erosion. Their suitability for crops can be improved by deep plowing.

Typically, the Cherry soil has a surface layer of grayish brown silt loam 4 inches thick. The subsoil is brown and very pale brown silt loam 24 inches thick. The substratum to a depth of 60 inches or more is very pale brown silt loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used mainly for nonirrigated cultivated crops and as rangeland. It is also used for grass-legume hay. The main nonirrigated crops are spring wheat and barley.

Crop management.—If this soil is used for nonirrigated cultivated crops, it is limited mainly by the hazards of soil blowing and water erosion. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. The amount of moisture in the soil can be increased by using tall grass barriers to minimize evaporation and trap snow. Return of crop residue helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces water erosion.

Range management.—The potential plant community is mainly little bluestem, western wheatgrass, green needlegrass, and winterfat. If the range is excessively grazed, these plants decrease and needleandthread, little porcupinegrass, blue grama, junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as cheatgrass, sixweeks fescue, weedlike forbs, and clubmoss may invade. The potential plant community will produce about 1,600 pounds of air-dry vegetation per acre in years of above-normal precipitation and 900 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Where clubmoss and blue grama are the dominant vegetation, practices such as pitting, furrowing, or chiseling can be used to improve areas of depleted rangeland. Such practices increase the water intake rate, reduce plant competition, and allow the more desirable native plants to increase. Where a source of water from runoff is available, yields can be increased by the use of water spreading.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, Rocky Mountain juniper, ponderosa pine, green ash, and blue spruce. Suitable shrubs are Siberian peashrub, American plum, Tatarian honeysuckle, and common chokecherry.

Homesite development.—If this soil is used for homesite development, it is limited mainly by the moderately slow permeability, low soil strength, frost action, and shrink-swell potential. If this soil is used for septic tank absorption fields, the moderately slow permeability can be compensated for by increasing the size of the absorption field. In the construction of basements or foundations for dwellings, the shrink-swell potential can be offset by backfilling with material that has low shrink-swell potential. Frost action and low soil strength can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

13—Dimmick silty clay, 0 to 1 percent slopes. This deep, very poorly drained soil is in depressional areas and lake basins on uplands. It is mostly in the eastern one-fourth of Roosevelt County and in the north-central part of Daniels County. It formed in alluvium and is subject to ponding. Slope is 0 to 1 percent. Slopes are mainly 25 to 100 feet long. Elevation is 2,200 to 2,600 feet.

Included in this unit are small areas of Nishon and McKenzie soils and Dimmick soils that have lime at a depth of 10 to 25 inches. Also included are small areas of soils in the north-central part of Daniels County that

have a sandy loam and sandy clay loam surface layer. These areas do not adversely affect the use and management of this unit as rangeland.

Typically, the surface is covered with a mat of roots and partly decomposed stems and leaves of plants 1 inch thick. The surface layer, where mixed to a depth of 7 inches, is gray silty clay. The upper 35 inches of the underlying material is gray silty clay, and the lower part to a depth of 60 inches or more is grayish brown silty clay.

Permeability is very slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is 60 inches or more. Runoff is ponded, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is 12 inches above the surface to a depth of 24 inches below the surface in April through July.

This soil is used mainly as rangeland.

Crop management.—This soil is poorly suited to cultivated crops. It is limited mainly by ponding.

Range management.—The potential plant community is mainly tall reedgrasses, prairie cordgrass, tall sedges, and American sloughgrass. If the range is excessively grazed, these plants decrease and tufted hairgrass, low sedges, Baltic rush, and western wheatgrass increase. If excessive grazing continues, plants such as Kentucky bluegrass, curly dock, foxtail barley, and Canada thistle may invade. The potential plant community will produce about 5,000 pounds of air-dry vegetation per acre in years of above-normal precipitation and 3,800 pounds in years of below-normal precipitation. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

Windbreak management.—This soil is poorly suited to windbreaks because of ponding.

Homesite development.—This soil is poorly suited to homesite development mainly because of ponding.

This map unit is in capability subclass Vw, nonirrigated. It is in Wet Meadow range site, 10- to 14-inch precipitation zone.

14—Dooley sandy loam, 0 to 4 percent slopes. This deep, well drained soil is on uplands. It formed in a mantle of eolian or alluvial material overlying glacial till. This soil is throughout the survey area except in the southwestern part of Roosevelt County. Slope is 0 to 4 percent. Slopes are mainly 800 to 1,800 feet long. Elevation is 2,400 to 3,000 feet.

Included in this unit are small areas of Parshall, Farnuf, and Williams soils and soils that are similar to this Dooley soil but have a layer of sandy loam 15 to 20 inches thick over glacial till. These soils do not adversely affect the use and management of this unit for nonirrigated cultivated crops. Also included are small areas of Tally soils. Tally soils are droughty. They can be improved by additions of barnyard manure.

Typically, the Dooley soil has a surface layer of dark grayish brown sandy loam 6 inches thick. The subsoil is grayish brown sandy clay loam 17 inches thick. The upper 14 inches of the substratum is grayish brown loam, and the lower part to a depth of 60 inches or more is light gray clay loam. Glacial till is at a depth of 20 to 36 inches.

Permeability is moderate to a depth of 23 inches and slow below this depth. Available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 40 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This soil is used mainly for nonirrigated cultivated crops, for grass hay, and as rangeland. The main nonirrigated crops are spring wheat, winter wheat, and barley.

Crop management.—If this soil is used for nonirrigated cultivated crops, it is limited by the hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing.

Range management.—The potential plant community is mainly needleandthread, prairie sandreed, thickspike wheatgrass, and Indian ricegrass. If the range is excessively grazed, prairie sandreed, thickspike wheatgrass, and Indian ricegrass decrease and needleandthread, blue grama, fringed sagewort, and threadleaf sedge increase. If excessive grazing continues, plants such as cheatgrass, Japanese brome, broom snakeweed, plains pricklypear, and weedlike forbs may invade. The potential plant community will produce about 1,600 pounds of air-dry vegetation per acre in years of above-normal precipitation and 900 pounds in years of below-normal precipitation. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, green ash, Siberian elm, Rocky Mountain juniper, ponderosa pine, and blue spruce. Suitable shrubs are Siberian peashrub, lilac, common chokecherry, American plum, and Tatarian honeysuckle. The risk of soil blowing can be reduced by cultivating only between the rows of windbreaks.

Homesite development.—If this soil is used for homesite development, it is limited mainly by the slow permeability of the substratum, shrink-swell potential, low soil strength, and frost action. If this soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. Frost action and low soil strength can adversely affect the quality of

roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IVe, nonirrigated. It is in Sandy range site, 10- to 14-inch precipitation zone.

15—Evanston loam, 2 to 8 percent slopes. This deep, well drained soil is on fans and terraces of uplands. It is in the southwestern part of Roosevelt County. It formed in alluvium. Slope is 2 to 8 percent. Slopes are mainly 200 to 800 feet long. Elevation is 2,000 to 2,500 feet.

Included in this unit are small areas of Telstad and Hillon soils. These areas do not adversely affect the use and management of this unit for nonirrigated cultivated crops.

Typically, the Evanston soil, where mixed to a depth of 7 inches, has a surface layer of brown loam. The upper 5 inches of the subsoil is brown clay loam, and the lower 11 inches is light brownish gray loam. The upper 11 inches of the substratum is brown loam, and the lower part to a depth of 60 inches or more is brown fine sandy loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used mainly for nonirrigated cultivated crops and as rangeland. The main nonirrigated crops are spring wheat and barley.

Crop management.—If this soil is used for nonirrigated cultivated crops, it is limited by the hazards of soil blowing and water erosion. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. The amount of moisture in the soil can be increased by using tall grass barriers to minimize evaporation and trap snow. Return of crop residue helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces water erosion.

Range management.—The potential plant community is mainly bluebunch wheatgrass, western wheatgrass, winterfat, and green needlegrass. If the range is excessively grazed, these plants decrease and needleandthread, little porcupinegrass, blue grama, junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as cheatgrass, sixweeks fescue, clubmoss, and weedlike forbs may invade. The potential plant community will produce about 1,700 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Where a source of water from runoff is available, yields can be increased by the use of water spreading.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, Rocky Mountain juniper, ponderosa pine, and green ash. Suitable shrubs are lilac, Siberian peashrub, American plum, Tatarian honeysuckle, and silver buffaloberry.

Homesite development.—If this soil is used for homesite development, it is limited mainly by the moderate permeability, shrink-swell potential, and frost action. If this soil is used for septic tank absorption fields, the limitation of moderate permeability can be overcome by increasing the size of the absorption field. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. Frost action can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome this limitation.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

16—Farland silt loam, 2 to 8 percent slopes. This deep, well drained soil is on fans and foot slopes of uplands. It is mostly in the eastern half of Roosevelt County and in most of Daniels County. It formed in alluvium derived from sedimentary material. Slope is 2 to 8 percent. Slopes are mainly 200 to 1,000 feet long. Elevation is 1,900 to 3,000 feet.

Included in this unit are small areas of Farnuf, Cherry, and Williams soils. These areas do not adversely affect the use and management of this unit for nonirrigated cultivated crops.

Typically, the Farland soil has a surface layer of dark grayish brown silt loam 7 inches thick. The subsoil is grayish brown silty clay loam 11 inches thick. The substratum to a depth of 60 inches or more is light brownish gray silt loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used mainly for nonirrigated cultivated crops and as rangeland. The main nonirrigated crops are spring wheat and barley.

Crop management.—If this soil is used for nonirrigated cultivated crops, it is limited mainly by the hazards of soil blowing and water erosion. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce

soil blowing and water erosion. The amount of moisture in the soil can be increased by using tall grass barriers to minimize evaporation and trap snow. Return of crop residue helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces water erosion.

Range management.—The potential plant community is mainly western wheatgrass, green needlegrass, little bluestem, and needleandthread. If the range is excessively grazed, western wheatgrass, green needlegrass, and little bluestem decrease and needleandthread, little porcupinegrass, blue grama, junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as cheatgrass, sixweeks fescue, weedlike forbs, and clubmoss may invade. The potential plant community will produce about 1,800 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,100 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Where a source of water from runoff is available, yields can be increased by the use of water spreading.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, Rocky Mountain juniper, ponderosa pine, green ash, and blue spruce. Suitable shrubs are Siberian peashrub, American plum, Tatarian honeysuckle, and common chokecherry.

Homesite development.—If this soil is used for homesite development, it is limited mainly by the moderately slow permeability, low soil strength, shrink-swell potential, and frost action. If the soil is used for septic tank absorption fields, the limitation of moderately slow permeability can be overcome by increasing the size of the absorption field. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. Frost action and low soil strength can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

17—Farland-Cherry silt loams, 2 to 8 percent slopes. This map unit is on fans and foot slopes of uplands. It is mostly in the eastern half of Roosevelt County and in most of Daniels County. Slope is 2 to 8 percent. Slopes are mainly 200 to 600 feet long. Elevation is 1,900 to 3,000 feet.

This unit is about 45 percent Farland silt loam and 40 percent Cherry silt loam. The Farland soil is in the less sloping areas of the unit, and the Cherry soil is in the steeper areas.

Included in this unit are small areas of Farnuf, Cabba, and Cambert soils. Included areas make up about 15 percent of the total acreage. The Farnuf soils do not adversely affect the use and management of this unit for nonirrigated cultivated crops. These soils are adjacent to small drainageways. The Cabba soils are shallow and have very low to low available water capacity. They can be farmed around, or they can be improved by adding barnyard manure and deep plowing. The Cambert soils are moderately deep and have moderate available water capacity. Additions of barnyard manure improve the available water capacity.

The Farland soil is deep and well drained. It formed in alluvium derived from sedimentary material. Typically, the Farland soil has a surface layer of dark grayish brown silt loam 7 inches thick. The subsoil is grayish brown silty clay loam 11 inches thick. The substratum to a depth of 60 inches or more is light brownish gray silt loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Cherry soil is deep and well drained. It formed in alluvium derived from sedimentary material. Typically, the Cherry soil has a surface layer of grayish brown silt loam 4 inches thick. The subsoil is brown and very pale brown silt loam 24 inches thick. The substratum to a depth of 60 inches or more is very pale brown silt loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used mainly for nonirrigated cultivated crops and as rangeland. It is also used for grass-legume hay. The main nonirrigated crops are spring wheat and barley.

Crop management.—If this unit is used for nonirrigated cultivated crops, it is limited mainly by the hazards of soil blowing and water erosion. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. The amount of moisture in the soil can be increased by using tall grass barriers to minimize evaporation and trap snow. Return of crop residue helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces water erosion.

Range management.—The potential plant community on this unit is mainly western wheatgrass, green needlegrass, little bluestem, and needleandthread. If the range is excessively grazed, western wheatgrass, green needlegrass, and little bluestem decrease and needleandthread, little porcupinegrass, blue grama,

junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as cheatgrass, sixweeks fescue, weedlike forbs, and clubmoss may invade. The potential plant community on the Farland soil produces about 1,800 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,100 pounds in years of below-normal precipitation. The potential plant community on the Cherry soil produces about 1,600 pounds of air-dry vegetation per acre in years of above-normal precipitation and 900 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. Where clubmoss and blue grama are the dominant vegetation, practices such as pitting, furrowing, or chiseling can be used to improve areas of depleted rangeland. Such practices increase the water intake rate, reduce plant competition, and allow the more desirable native plants to increase. Where a source of water from runoff is available, yields can be increased by the use of water spreading.

Windbreak management.—This unit is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, Rocky Mountain juniper, ponderosa pine, green ash, and blue spruce. Suitable shrubs are Siberian peashrub, American plum, Tatarian honeysuckle, and common chokecherry.

Homesite development.—If this unit is used for homesite development, it is limited mainly by low soil strength, the moderately slow permeability, shrink-swell potential, and frost action. If this unit is used for septic tank absorption fields, the limitation of moderately slow permeability can be overcome by increasing the size of the absorption field. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. Frost action and low soil strength can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

18—Farnuf loam, 2 to 8 percent slopes. This deep, well drained soil is on fans and terraces on uplands. It is throughout the survey area except in the southwestern part of Roosevelt County. The soil formed in alluvium. Slope is 2 to 8 percent. Slopes are mainly 150 to 300 feet long. Elevation is 2,000 to 3,000 feet.

Included in this unit are small areas of Farland, Bowbells, and Williams soils. These areas do not adversely affect the use and management of this unit for nonirrigated cultivated crops. Also included are small areas of Turner soils. The Turner soils have low to moderate available water capacity and are subject to a high hazard of soil blowing. Additions of barnyard manure improve the available water capacity and reduce the hazard of soil blowing.

Typically, the Farnuf soil, where mixed to a depth of 7 inches, has a surface layer of brown loam. The upper 11 inches of the subsoil is yellowish brown clay loam, and the lower 4 inches is pale brown silt loam. The upper 14 inches of the substratum is very pale brown silty clay loam, and the lower part to a depth of 60 inches or more is light brownish gray sandy loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used mainly for nonirrigated cultivated crops and as rangeland. The main nonirrigated crops are spring wheat and barley.

Crop management.—If this soil is used for nonirrigated cultivated crops, it is limited mainly by the hazards of soil blowing and water erosion. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. The amount of moisture in the soil can be increased by using tall grass barriers to minimize evaporation and trap snow. Return of crop residue helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces water erosion.

Range management.—The potential plant community is mainly western wheatgrass, needleandthread, winterfat, and green needlegrass. If the range is excessively grazed, western wheatgrass, winterfat, and green needlegrass decrease and needleandthread, little porcupinegrass, blue grama, junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as cheatgrass, sixweeks fescue, and weedlike forbs may invade. The potential plant community will produce about 1,800 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,100 pounds in years of below-normal precipitation.

Where a source of water from runoff is available, yields can be increased by the use of water spreading. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Siberian elm, Russian-olive, Rocky Mountain juniper, cottonwood, and ponderosa pine. Suitable shrubs are Siberian peashrub, American plum, Tatarian honeysuckle, and silver buffaloberry.

Homesite development.—If this soil is used for homesite development, it is limited mainly by the moderate permeability, shrink-swell potential, and frost action. If this soil is used for septic tank absorption fields, the limitation of moderate permeability can be overcome by increasing the size of the absorption field.

In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. Frost action can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome this limitation.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

19—Fluvaquents, ponded, 0 to 1 percent slopes. This map unit consists of deep, very poorly drained soils along intermittent and perennial streams and in oxbows and depressional areas. These soils formed in recent alluvium throughout the survey area. Slope is 0 to 1 percent. Elevation is 1,875 to 2,900 feet. The amount of time during which these soils are covered with water is extremely variable from year to year. In most years, water ponds during spring runoff. Depending on the intensity and frequency of the summer rains, the surface may be free of water, partly ponded, or covered with water the entire summer and fall.

Included in the mapped areas of this unit are small areas of Lallie soils, Typic Fluvaquents, and Fluvaquents, saline. The included areas make up about 15 percent of the map unit. They are capable of producing a significant amount of forage.

Fluvaquents, ponded, are extremely variable. They range from sandy loam to clay throughout the profile.

Permeability is very slow, and available water capacity is low to high. Effective rooting depth is 60 inches or more for water-tolerant plants. Runoff is ponded. A water table is 48 inches above the surface to 6 inches below the surface in most years.

These soils are used mainly for waterfowl habitat and as a source of water for use by livestock. The vegetation is mostly rushes and cattails. Grazing is limited mainly by ponding and wetness.

Crop management.—These soils are not suited to cultivated crops. They are limited mainly by ponding and wetness.

Windbreak management.—These soils are not suited to windbreaks because of ponding and wetness.

Homesite development.—These soils are not suited to homesite development. They are limited mainly by ponding.

This map unit is in capability subclass VIIIw.

20—Fluvaquents, saline, 0 to 2 percent slopes. This unit consists of deep, wet, salt-affected soils along intermittent and perennial streams, in oxbows and depressional areas, and in abandoned stream channels. These soils formed in deposits of recent alluvium. They are subject to flooding. The soils are throughout the survey area. Slope is 0 to 2 percent. Slopes are mainly 10 to 50 feet long. Elevation is 1,875 to 2,900 feet.

Included in this unit are small areas of Riverwash. These areas produce little, if any, forage. Also included are small areas of Typic Fluvaquents, Typic Ustifluvents, and Lallie soils. These areas do not adversely affect the use and management of this unit as rangeland.

Fluvaquents, saline, generally are poorly drained or very poorly drained, are strongly salt-affected, and are subject to frequent periods of flooding. They are erratically stratified with very gravelly sand to clay.

Permeability is very slow to rapid. The available water capacity is very low to high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is more than 60 inches. Runoff is ponded to slow, and the hazard of water erosion is moderate. The hazard of soil blowing is slight. These soils commonly have a water table within 36 inches of the surface throughout the year. This unit is subject to frequent periods of flooding. Channeling and deposition are common along streambanks.

This unit is used mainly as rangeland.

Crop management.—This unit is poorly suited to cultivated crops. It is limited mainly by frequent periods of flooding, wetness, strong salinity, and variability of soil texture.

Range management.—The potential plant community is mainly tall reedgrasses, prairie cordgrass, tall sedges, and American sloughgrass. If the range is excessively grazed, these plants decrease and tufted hairgrass, low sedges, Baltic rush, inland saltgrass, and western wheatgrass increase. If excessive grazing continues, plants such as Kentucky bluegrass, curly dock, foxtail barley, and Canada thistle may invade. The potential plant community will produce about 3,000 pounds of air-dry vegetation per acre in years of above-normal precipitation and 2,000 pounds in years of below-normal precipitation. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

Windbreak management.—This unit is poorly suited to windbreaks because of wetness and strong salinity.

Homesite development.—This unit is poorly suited to homesite development. It is limited mainly by frequent periods of flooding and wetness.

This map unit is in capability subclass VIIw, nonirrigated. It is in Wet Meadow range site, 10- to 14-inch precipitation zone.

21—Glendive fine sandy loam, protected, 0 to 2 percent slopes. This deep, well drained, droughty soil is on the Missouri River flood plain, in the southwestern part of Roosevelt County. It is on the parts of the Missouri River flood plain that are protected from flooding by Fort Peck Dam. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly 50 to 400 feet long. Elevation is 1,900 to 2,000 feet.

Included in this unit are small areas of protected Havre soils and Banks soils. The protected Havre soils do not adversely affect the use and management of this unit for cultivated crops. The Banks soils are droughty and commonly are adjacent to the Missouri River. Additions of crop residue such as wheat or barley straw increases the available water capacity.

Typically, the Glendive soil has a surface layer of pale brown fine sandy loam 7 inches thick. The upper 8 inches of the underlying material is pale brown fine sandy loam, and the lower part to a depth of 60 inches or more is pale brown fine sandy loam and a few thin strata of loamy sand, sandy loam, and silt loam.

Permeability is moderately rapid, and available water capacity is moderate to high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 50 inches. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This soil is used mainly for nonirrigated and irrigated cultivated crops and as rangeland. It is also used as woodland. The main nonirrigated crops are spring wheat, winter wheat, barley, and alfalfa hay. The main irrigated crops are spring wheat and alfalfa hay.

Crop management.—If this soil is used for nonirrigated cultivated crops, it is limited by the hazard of soil blowing and droughtiness. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. Additions of barnyard manure improve the available water capacity. If this soil is used for irrigated cultivated crops, it is limited by the moderately rapid permeability. Sprinkler irrigation is a suitable method. Crops respond to phosphate and nitrogen fertilizer.

Range management.—Where this soil is grassland, the potential plant community is mainly needleandthread, prairie sandreed, Indian ricegrass, and thickspike wheatgrass. If the range is excessively grazed, prairie sandreed, thickspike wheatgrass, and Indian ricegrass decrease and needleandthread, blue grama, fringed sagewort, and threadleaf sedge increase. If excessive grazing continues, plants such as cheatgrass, Japanese brome, broom snakeweed, plains pricklypear, and weedlike forbs may invade. The potential plant community will produce about 1,600 pounds of air-dry vegetation per acre in years of above-normal precipitation and 900 pounds in years of below-normal precipitation. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Where this soil is forested, the potential native understory vegetation beneath a fully stocked stand of plains cottonwood is western wheatgrass, green needlegrass, rose, snowberry, common chokecherry, prairie junegrass, poison-ivy, American licorice, green ash, Saskatoon serviceberry, redosier dogwood, silver buffaloberry, and starry false-Solomons-seal.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, American plum, Tatarian honeysuckle, silver buffaloberry, and lilac. The risk of soil blowing can be reduced by cultivating only between the rows of windbreaks.

Forest management.—This soil is suited to plains cottonwood. The site index for plains cottonwood is 65. The potential annual production per acre is about 30 cubic feet or 160 board feet (Scribner rule). Potential production is for an even-aged, fully stocked stand of trees.

The main limitations for timber management are the difficulty of reestablishing plains cottonwood and soil compaction. The understory vegetation competes vigorously with tree seedlings for the limited amount of available water. Reduction of competing vegetation encourages adequate natural regeneration and the survival of planted seedlings. Shelterwood and selection silvicultural harvesting systems improve regeneration. Compaction of the soil can occur if vehicles are used when the soil is wet. This limitation can be overcome by using vehicles only when the soil is dry or is covered with snow or by using cable yarding systems when the soil is susceptible to compaction.

Homesite development.—This soil is well suited to homesite development.

This map unit is in capability subclass IVe, nonirrigated and irrigated. It is in Sandy range site, 10- to 14-inch precipitation zone.

22—Grail silty clay loam, 0 to 4 percent slopes. This deep, well drained soil is in depressional areas on uplands. It formed in alluvium. This soil is throughout the survey area except in the southwestern part of Roosevelt County. Slope is 0 to 4 percent. Slopes are mainly 100 to 500 feet long. Elevation is 2,000 to 3,000 feet.

Included in this unit are small areas of Bowbells, Savage, Farnuf, and Williams soils. These areas do not adversely affect the use and management of this unit for nonirrigated cultivated crops.

Typically, the Grail soil has a surface layer of grayish brown silty clay loam 5 inches thick. The subsoil is very dark grayish brown and dark grayish brown silty clay 25 inches thick. The substratum to a depth of 60 inches or more is dark grayish brown silty clay.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 45 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight. This soil receives additional moisture as a result of runoff from the adjacent uplands.

This soil is used mainly for nonirrigated cultivated crops, for grass hay, and as rangeland. The main nonirrigated crops are spring wheat and barley.

Crop management.—This soil is well suited to nonirrigated cultivated crops. It is limited mainly by the hazard of water erosion. Minimum tillage, contour cultivation, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce water erosion. The amount of moisture in the soil can be increased by using tall grass barriers to minimize evaporation and trap snow. Return of crop residue helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces water erosion.

Range management.—The potential plant community on this soil is mainly western wheatgrass, porcupinegrass, green needlegrass, and winterfat. If the range is excessively grazed, these plants decrease and needleandthread, silver sagebrush, perennial forbs, and fringed sagewort increase. If excessive grazing continues, plants such as Kentucky bluegrass, Canada bluegrass, and weedlike forbs may invade. The potential plant community will produce about 3,600 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,800 pounds in years of below-normal precipitation. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, Rocky Mountain juniper, ponderosa pine, green ash, and blue spruce. Suitable shrubs are Siberian peashrub, American plum, and Tatarian honeysuckle.

Homesite development.—If this soil is used for homesite development, it is limited mainly by the slow permeability, shrink-swell potential, and low soil strength. If buildings are constructed on this soil, properly design foundations and footings and divert runoff away from buildings to help prevent structural damage as a result of shrinking and swelling. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. If this soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Overflow range site, 10- to 14-inch precipitation zone.

23—Harlem silty clay loam, protected, 0 to 2 percent slopes. This deep, well drained soil is on the Missouri River flood plain, in the southwestern part of Roosevelt County. This soil is on the parts of the Missouri River flood plain that are protected from flooding by Fort Peck Dam. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly 50 to 250 feet long. Elevation is 1,875 to 2,000 feet.

Included in this unit are small areas of protected Havre soils and Harlem soils that have a silt loam or silty clay surface layer. These areas do not adversely affect the use and management of this unit for cultivated crops. Also included are small areas of Bowdoin and Lallie soils and protected Harlem soils that are saline. The areas of Bowdoin soils and protected Harlem soils are low in productivity. The Lallie soils are wet, are moderately saline to very strongly saline, and are difficult to work in spring.

Typically, the Harlem soil has a surface layer of grayish brown silty clay loam 4 inches thick. The underlying material to a depth of 60 inches or more is grayish brown silty clay.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This soil is used mainly for irrigated cultivated crops. It is also used for nonirrigated cultivated crops and as rangeland. The main irrigated crops are spring wheat, barley, alfalfa hay, and grass-legume hay. The main nonirrigated crops are spring wheat, winter wheat, barley, and alfalfa hay.

Crop management.—This soil is suited to nonirrigated cultivated crops. The soil is difficult to till when it is dry, and it is subject to clodding and compaction if it is tilled when wet. The content of soil moisture is optimum for tillage for only a short period. Leaving crop residue on or near the surface conserves moisture, increases the water intake rate, and improves tilth.

This soil is suited to irrigated crops. Furrow, border, corrugation, and sprinkler irrigation systems are suited to the soil. The rate of water application is a concern in irrigation design because of the slow water intake rate and slow permeability. Water should be applied at a slow rate over a long period to insure that the root zone is properly wetted.

Range management.—The potential plant community is mainly western wheatgrass, winterfat, green needlegrass, and plains muhly. If the range is excessively grazed, these plants decrease and Sandberg bluegrass, plains reedgrass, silver sagebrush, and blue grama increase. If excessive grazing continues, plants such as broom snakeweed, plains pricklypear, sweetclover, and weedlike forbs may invade. The potential plant community will produce about 1,700 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by

livestock. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Siberian elm, cottonwood, green ash, ponderosa pine, and blue spruce. Suitable shrubs are Siberian peashrub, American plum, Tatarian honeysuckle, and common chokecherry.

Homesite development.—If this soil is used for homesite development, it is limited mainly by the slow permeability, low soil strength, and shrink-swell potential. If the soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field. In the construction of basements or foundations for dwellings, the limitation of shrinking and swelling can be overcome by backfilling with suitable material that has low shrink-swell potential. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIs, nonirrigated and irrigated. It is in Clayey range site, 10- to 14-inch precipitation zone.

24—Havre silt loam, protected, 0 to 2 percent slopes. This deep, well drained soil is on flood plains in the southwestern part of Roosevelt County. This soil is on the parts of the Missouri River flood plain that are protected from flooding by Fort Peck Dam. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly 50 to 250 feet long. Elevation is 1,875 to 2,000 feet.

Included in this unit are small areas of protected Harlem and Glendive soils. Also included are small areas of protected Havre soils that have a loam or silty clay surface layer. These areas do not adversely affect the use and management of this unit for cultivated crops.

Typically, the Havre soil has a surface layer of light brownish gray silt loam 7 inches thick. The underlying material to a depth of 60 inches or more is pale brown loam with thin lenses of fine sandy loam and very fine sandy loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is calcareous throughout.

This soil is used mainly for nonirrigated and irrigated cultivated crops and as rangeland. It is also used as woodland. The main nonirrigated crops are spring wheat, barley, and alfalfa hay. The main irrigated crops are spring wheat and alfalfa hay.

Crop management.—If this soil is used for nonirrigated cultivated crops, it is limited by the hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. This soil is well suited to irrigated crops. Furrow, border, corrugation, and sprinkler irrigation systems are suited to the soil.

Range management.—Where this soil is grassland, the potential plant community is mainly bluebunch wheatgrass, western wheatgrass, winterfat, and green needlegrass. If the range is excessively grazed, these plants decrease and needleandthread, little porcupinegrass, blue grama, junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as cheatgrass, sixweeks fescue, clubmoss, and weedlike forbs may invade. The potential plant community will produce about 1,900 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,300 pounds in years of below-normal precipitation. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Where this soil is forested, the potential native understory plants beneath a fully stocked stand of plains cottonwood is western wheatgrass, green needlegrass, rose, snowberry, common chokecherry, prairie junegrass, poison-ivy, American licorice, green ash, Saskatoon serviceberry, redosier dogwood, and silver buffaloberry. Yield decreases and the composition of the understory changes as the overstory tree canopy increases.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, cottonwood, Siberian elm, Rocky Mountain juniper, and blue spruce. Suitable shrubs are lilac, Siberian peashrub, American plum, Tatarian honeysuckle, and common chokecherry.

Forest management.—This soil is suited to plains cottonwood. The site index for plains cottonwood is 65. The potential annual production per acre is about 30 cubic feet or 160 board feet (Scribner rule). Potential production is for an even-aged, fully stocked stand of trees.

The main limitations for timber management are the difficulty of reestablishing plains cottonwood and soil compaction. The understory vegetation competes vigorously with tree seedlings for the limited amount of available water. Reduction of competing vegetation encourages adequate natural regeneration and the survival of planted seedlings. Shelterwood and selection silvicultural harvesting systems improve regeneration. The soil has low strength when wet, which results in poor trafficability and the possibility of soil compaction when heavy equipment is used to yard logs. Operating equipment only when the soil is dry or frozen can overcome this limitation.

Homesite development.—If this soil is used for homesite development, it is limited mainly by the moderate permeability and low soil strength. If the soil is used for septic tank absorption fields, the limitation of moderate permeability can be overcome by increasing the size of the absorption field. Low soil strength can

adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome this limitation.

This map unit is in capability subclasses IIIe, nonirrigated, and IIe, irrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

25—Havre-Glendive complex, protected, 0 to 2 percent slopes. This map unit is on the flood plain of the Missouri River, in the southwestern part of Roosevelt County. This unit is on the parts of the Missouri River flood plain that are protected from flooding by Fort Peck Dam. Slope is 0 to 2 percent. Slopes are mainly 50 to 250 feet long. Elevation is 1,875 to 2,000 feet.

This unit is about 60 percent Havre silt loam and 30 percent Glendive fine sandy loam.

Included in this unit are small areas of protected Harlem soils. These areas do not adversely affect the use and management of this unit for cultivated crops. Also included are small areas of Riverwash, immediately adjacent to the Missouri River. These small included areas are subject to frequent periods of flooding. Included areas make up about 10 percent of the total acreage.

The Havre soil is deep and well drained. It formed in alluvium. Typically, the Havre soil has a surface layer of light brownish gray silt loam 7 inches thick. The underlying material to a depth of 60 inches or more is pale brown loam with thin lenses of fine sandy loam and very fine sandy loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is calcareous throughout.

The Glendive soil is deep, well drained, and droughty. It formed in alluvium. Typically, the Glendive soil has a surface layer of pale brown fine sandy loam 7 inches thick. The upper 8 inches of the underlying material is pale brown fine sandy loam, and the lower part to a depth of 60 inches or more is pale brown fine sandy loam and a few thin strata of loamy sand, sandy loam, and silt loam.

Permeability is moderately rapid, and available water capacity is moderate to high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 50 inches. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This unit is used mainly for nonirrigated and irrigated cultivated crops and as rangeland. It is also used as woodland. The main nonirrigated crops are spring wheat, barley, and alfalfa hay. The main irrigated crops are spring wheat and alfalfa hay.

Crop management.—If this unit is used for nonirrigated cultivated crops, it is limited by the hazard of soil blowing and the droughtiness of the Glendive soil. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. Additions of barnyard manure improve the available water capacity.

If this unit is used for irrigated cultivated crops, it is limited by the moderately rapid permeability of the Glendive soil. Sprinkler irrigation is a suitable method. If furrow irrigation is used, water should be applied at frequent intervals and runs should be short.

Range management.—Where the Havre soil is grassland, the potential plant community is mainly bluebunch wheatgrass, western wheatgrass, winterfat, and green needlegrass. If the range is excessively grazed, these plants decrease and needleandthread, little porcupinegrass, blue grama, junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as cheatgrass, sixweeks fescue, clubmoss, and weedlike forbs may invade. The potential plant community will produce about 1,900 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,300 pounds in years of below-normal precipitation.

Where the Havre soil is forested, the potential native understory plants beneath a fully stocked stand of plains cottonwood is western wheatgrass, green needlegrass, rose, snowberry, common chokecherry, prairie junegrass, poison-ivy, American licorice, green ash, Saskatoon serviceberry, redosier dogwood, silver buffaloberry, and starry false-Solomons-seal. Yield decreases and the composition of the understory changes as the overstory tree canopy increases.

Where the Glendive soil is grassland, the potential plant community is mainly needleandthread, prairie sandreed, Indian ricegrass, and thickspike wheatgrass. If the range is excessively grazed, prairie sandreed, thickspike wheatgrass, and Indian ricegrass decrease and needleandthread, blue grama, fringed sagewort, and threadleaf sedge increase. If excessive grazing continues, plants such as cheatgrass, Japanese brome, broom snakeweed, plains pricklypear, and weedlike forbs may invade. The potential plant community will produce about 1,600 pounds of air-dry vegetation per acre in years of above-normal precipitation and 900 pounds in years of below-normal precipitation.

Where the Glendive soil is forested, the potential native understory plants beneath a fully stocked stand of plains cottonwood is western wheatgrass, green needlegrass, rose, snowberry, common chokecherry, prairie junegrass, poison-ivy, American licorice, green ash, Saskatoon serviceberry, redosier dogwood, silver buffaloberry, and starry false-Solomons-seal. Yield decreases and the composition of the understory changes as the overstory tree canopy increases.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice on this unit.

Windbreak management.—This unit is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, lilac, American plum, and Tatarian honeysuckle.

Forest management.—This unit is suited to plains cottonwood. The site index for plains cottonwood is 65. The potential annual production per acre is 30 cubic feet or 160 board feet (Scribner rule). Potential production is for an even-aged, fully stocked stand of trees.

The main forest management concerns on this unit are the difficulty of reestablishing plains cottonwood, soil compaction, and poor trafficability of the Havre soil. The understory vegetation competes vigorously with tree seedlings for the limited amount of available water. Reduction of competing vegetation encourages adequate natural regeneration and the survival of planted seedlings. Shelterwood and selection silvicultural harvesting systems improve regeneration. The Havre soil has low strength when wet, which results in poor trafficability. Both soils in this unit are susceptible to compaction by heavy equipment when they are wet. Operating equipment only when the soil is dry or frozen can overcome this limitation.

Homesite development.—If this unit is used for homesite development, it is limited mainly by the moderate permeability and low soil strength of the Havre soil and by the moderately rapid permeability of the Glendive soil. If the Havre soil is used for septic tank absorption fields, the limitation of moderate permeability can be overcome by increasing the size of the absorption field. Seepage is a concern on the Glendive soil. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome this limitation.

This map unit is in capability subclasses IIIe, nonirrigated, and IIe, irrigated. The Havre soil is in Silty range site, 10- to 14-inch precipitation zone, and the Glendive soil is in Sandy range site, 10- to 14-inch precipitation zone.

26—Havrelon loam, 0 to 2 percent slopes. This deep, well drained soil is on flood plains of the tributaries of the Missouri River. It is throughout the survey area except in the southwestern part of Roosevelt County. The soil formed in alluvium. It is subject to flooding. Slope is 0 to 2 percent. Slopes are mainly 50 to 250 feet long. Elevation is 1,875 to 2,500 feet.

Included in this unit are small areas of Lohler and Trembles soils and Havrelon soils that have a silt loam or silty clay loam surface layer. These areas do not adversely affect the use and management of this unit for nonirrigated cultivated crops. Also included are small areas of Typic Ustifluvents. The Typic Ustifluvents are poorly suited to nonirrigated cultivated crops because of their variability in texture and susceptibility to frequent periods of flooding.

Typically, the Havrelon soil has a surface layer of grayish brown loam 7 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray and grayish brown, stratified silt loam, loam, and very fine sandy loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is subject to flooding during prolonged, high intensity storms. Channeling and deposition are common along streambanks. The soil is subject to occasional periods of flooding from April through June. It is calcareous throughout.

This soil is used mainly for nonirrigated cultivated crops, for grass-legume hay, and as rangeland. The main nonirrigated crops are spring wheat and barley.

Crop management.—If this soil is used for nonirrigated cultivated crops, it is limited by flooding in spring and the hazard of soil blowing. Flooding may delay planting. Soil blowing can be reduced by using all crop residue and practicing minimum tillage.

Range management.—The potential plant community is mainly western wheatgrass, porcupinegrass, green needlegrass, and winterfat. If the range is excessively grazed, these plants decrease and needleandthread, perennial forbs, fringed sagewort, and silver sagebrush increase. If excessive grazing continues, plants such as Kentucky bluegrass, Canada bluegrass, and weedlike forbs may invade. The potential plant community will produce about 3,800 pounds of air-dry vegetation per acre in years of above-normal precipitation and 2,000 pounds in years of below-normal precipitation. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, Rocky Mountain juniper, cottonwood, and blue spruce. Suitable shrubs are Siberian peashrub, American plum, Tatarian honeysuckle, common chokecherry, and lilac.

Homesite development.—This soil is poorly suited to homesite development mainly because of the occasional periods of flooding.

This map unit is in capability subclass IIIw, nonirrigated. It is in Overflow range site, 10- to 14-inch precipitation zone.

27—Havrelon silt loam, protected, 0 to 2 percent slopes. This deep, well drained soil is on flood plains. It is throughout the survey area except in the southwestern part of Roosevelt County. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly 50 to 250 feet long. Elevation is 1,875 to 2,000 feet.

Included in this unit are small areas of protected Lohler and Trembles soils. Also included are small areas of protected Havrelon soils that have a loam or silty clay loam surface layer. These areas do not adversely affect the use and management of this unit for cultivated crops.

Typically, the Havrelon soil has a surface layer of light brownish gray silt loam 13 inches thick. The upper 21 inches of the underlying material is light brownish gray silt loam, the next 21 inches is light brownish gray silty clay loam, and the lower part to a depth of 60 inches or more is grayish brown silty clay loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is calcareous throughout.

This soil is used mainly for nonirrigated cultivated crops and as rangeland. It is also used for irrigated cultivated crops and as woodland. The main nonirrigated crops are spring wheat, winter wheat, barley, grass hay, and alfalfa hay. The main irrigated crops are spring wheat, barley, alfalfa hay, and corn for silage.

Crop management.—If this soil is used for nonirrigated cultivated crops, it is limited by the hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. This soil is well suited to irrigated crops. Furrow, border, corrugation, and sprinkler irrigation systems are suited to the soil. Where irrigated, this soil produces about 25 tons of corn for silage per acre under a high level of management.

Range management.—Where this soil is grassland, the potential plant community is mainly bluebunch wheatgrass, western wheatgrass, winterfat, and green needlegrass. If the range is excessively grazed, these plants decrease and needleandthread, little porcupinegrass, blue grama, junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as cheatgrass, sixweeks fescue, clubmoss, and weedlike forbs may invade. The potential plant community will produce about 2,000 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,300 pounds in years of below-normal precipitation. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Where this soil is forested, the potential native understory beneath a fully stocked stand of plains cottonwood is western wheatgrass, green needlegrass, rose, snowberry, common chokecherry, prairie junegrass, poison-ivy, American licorice, green ash, Saskatoon serviceberry, redosier dogwood, silver buffaloberry, and starry false-Solomons-seal. Yield decreases and the composition of the understory changes as the overstory tree canopy increases.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, cottonwood, Siberian elm, Rocky Mountain juniper, and blue spruce. Suitable shrubs are lilac, Siberian peashrub, American plum, Tatarian honeysuckle, and common chokecherry.

Forest management.—This soil is suited to plains cottonwood. The site index for plains cottonwood is 65. The potential annual production per acre is about 30 cubic feet or 160 board feet (Scribner rule). Potential production is for an even-aged, fully stocked stand of trees.

The main limitations for timber management are the difficulty of reestablishing plains cottonwood and soil compaction. The understory vegetation competes vigorously with tree seedlings for the limited amount of available water. Reduction of competing vegetation encourages adequate natural regeneration and the survival of planted seedlings. Shelterwood and selection silvicultural harvesting systems improve regeneration. The soil has low strength when wet, which results in poor trafficability and the possibility of soil compaction when heavy equipment is used to yard logs. Operating equipment only when the soil is dry or frozen can overcome this limitation.

Homesite development.—If this soil is used for homesite development, it is limited mainly by shrink-swell potential, low soil strength, and frost action. If buildings are constructed on this soil, properly design foundations and footings and divert runoff away from buildings to help prevent structural damage as a result of shrinking and swelling. Frost action and low soil strength can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclasses IIIe, nonirrigated, and IIe, irrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

28—Havrelon-Trembles complex, 0 to 2 percent slopes. This map unit is on flood plains of tributaries of the Missouri River. The areas are scattered throughout the survey area except the southwestern part of Roosevelt County. This unit is subject to flooding. Slope is 0 to 2 percent. Slopes are mainly 50 to 250 feet long. Elevation is 1,875 to 2,500 feet.

This unit is about 60 percent Havrelon loam and 30 percent Trembles fine sandy loam.

Included in the mapped areas are small areas of Lohler, Lallie, and Banks soils, which make up about 10 percent of the total acreage. Droughtiness is the main limitation of the Banks soils for nonirrigated cultivated crops. Addition of crop residue such as wheat or barley straw increases the available water capacity. The Lallie soils are poorly suited to nonirrigated cultivated crops because of wetness and moderate to strong salinity. The

Lohler soils do not adversely affect the use and management of this unit for nonirrigated cultivated crops.

The Havrelon soil is deep and well drained. It formed in alluvium. Typically, the Havrelon soil has a surface layer of grayish brown loam 7 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray and grayish brown loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is calcareous throughout.

The Trembles soil is deep, well drained, and droughty. It formed in alluvium. Typically, the Trembles soil has a surface layer of light brownish gray fine sandy loam 8 inches thick. The upper 23 inches of the underlying material is brown sandy loam and has a few thin strata of loam, the next 17 inches is pale brown sandy loam and has a few thin strata of loam and loamy sand, and the lower part to a depth of 60 inches or more is pale brown loamy sand.

Permeability is moderately rapid, and available water capacity is moderate to high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 50 inches. Runoff is very slow to slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This unit is subject to occasional periods of flooding from April through June. Channeling and deposition are common along streambanks.

This unit is used mainly for nonirrigated cultivated crops, for grass hay, and as rangeland. The main nonirrigated crops are spring wheat and barley.

Crop management.—If this unit is used for nonirrigated cultivated crops, it is limited by the hazard of flooding in spring, the hazard of soil blowing, and the droughtiness of the Trembles soil. Flooding may delay planting. Soil blowing can be reduced by using all crop residue and practicing minimum tillage. Addition of crop residue such as wheat or barley straw increases the available water capacity of the Trembles soil.

Range management.—The potential plant community on the Havrelon soil is mainly western wheatgrass, porcupinegrass, green needlegrass, and winterfat. If the range is excessively grazed, these plants decrease and needleandthread, perennial forbs, fringed sagewort, and silver sagebrush increase. If excessive grazing continues, plants such as Kentucky bluegrass, Canada bluegrass, and weedlike forbs may invade. The potential plant community will produce about 3,800 pounds of air-dry vegetation per acre in years of above-normal precipitation and 2,000 pounds in years of below-normal precipitation.

The potential plant community on the Trembles soil is mainly western wheatgrass, green needlegrass, prairie sandreed, and winterfat. If the range is excessively grazed, these plants decrease and needleandthread, fringed sagewort, silver sagebrush, and perennial forbs increase. If excessive grazing continues, plants such as Kentucky bluegrass, Canada bluegrass, and weedlike forbs may invade. The potential plant community will produce about 1,900 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This unit is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, Rocky Mountain juniper, cottonwood, and blue spruce. Suitable shrubs are Siberian peashrub, American plum, Tatarian honeysuckle, common chokecherry, Nanking cherry, and lilac.

Homesite development.—If this unit is used for homesite development, it is limited mainly by the occasional periods of flooding in spring.

This map unit is in capability subclass IIIw, nonirrigated. It is in Overflow range site, 10- to 14-inch precipitation zone.

29—Havrelon-Trembles complex, protected, 0 to 2 percent slopes. This map unit is on flood plains. It is throughout the survey area except in the southwestern part of Roosevelt County. Slope is 0 to 2 percent. Slopes are mainly 50 to 250 feet long. Elevation is 1,875 to 2,000 feet.

This unit is about 60 percent Havrelon silt loam and 30 percent Trembles fine sandy loam.

Included in this unit are small areas of Banks soils and protected Lohler soils. Included areas make up about 10 percent of the total acreage. Droughtiness is the main limitation of the Banks soils for cultivated crops. Addition of crop residue such as wheat or barley straw increases the available water capacity. The protected Lohler soils do not adversely affect the use and management of this unit for cultivated crops.

The Havrelon soil is deep and well drained. It formed in alluvium. Typically, the Havrelon soil has a surface layer of light brownish gray silt loam 13 inches thick. The upper 21 inches of the underlying material is light brownish gray silt loam, the next 21 inches is light brownish gray silty clay loam, and the lower part to a depth of 60 inches or more is grayish brown silty clay loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is calcareous throughout.

The Trembles soil is deep, well drained, and droughty. It formed in alluvium. Typically, the Trembles soil has a

surface layer of light brownish gray fine sandy loam 8 inches thick. The upper 23 inches of the underlying material is brown sandy loam and has a few thin strata of loam, the next 17 inches is pale brown sandy loam and has a few thin strata of loam and loamy sand, and the lower part to a depth of 60 inches or more is pale brown loamy sand.

Permeability is moderately rapid, and available water capacity is moderate to high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 50 inches. Runoff is very slow to slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This unit is used mainly for nonirrigated cultivated crops, for grass hay, and as rangeland. It is also used for irrigated cultivated crops and as woodland. The main nonirrigated crops are spring wheat, winter wheat, barley, and alfalfa hay. The main irrigated crops are spring wheat, alfalfa hay, and corn for silage.

Crop management.—If this unit is used for nonirrigated cultivated crops, it is limited by the hazard of soil blowing and the droughtiness of the Trembles soil. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. Addition of barnyard manure improves the available water capacity of the Trembles soil.

If this unit is used for irrigated cultivated crops, it is limited by the moderately rapid permeability of the Trembles soil. Sprinkler irrigation is a suitable method. If furrow irrigation is used, water should be applied at frequent intervals and runs should be short. Where irrigated, this unit produces about 22 tons of corn for silage per acre under a high level of management.

Range management.—Where the Havrelon soil is grassland, the potential plant community is mainly bluebunch wheatgrass, western wheatgrass, winterfat, and green needlegrass. If the range is excessively grazed, these plants decrease and needleandthread, little porcupinegrass, blue grama, junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as cheatgrass, sixweeks fescue, clubmoss, and weedlike forbs may invade. The potential plant community will produce about 2,000 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,300 pounds in years of below-normal precipitation.

Where the Havrelon soil is forested, the potential native understory plants beneath a fully stocked stand of plains cottonwood is western wheatgrass, green needlegrass, rose, snowberry, common chokecherry, prairie junegrass, poison-ivy, American licorice, green ash, Saskatoon serviceberry, redosier dogwood, silver buffaloberry, and starry false-Solomons-seal. Yield decreases and the composition of the understory changes as the overstory tree canopy increases.

Where the Trembles soil is grassland, the potential plant community is mainly prairie sandreed, needleandthread, thickspike wheatgrass, and Indian ricegrass. If the range is excessively grazed, prairie sandreed, thickspike wheatgrass, and Indian ricegrass decrease and needleandthread, blue grama, threadleaf sedge, and fringed sagewort increase. If excessive grazing continues, plants such as cheatgrass, Japanese brome, broom snakeweed, plains pricklypear, and weedlike forbs may invade. The potential plant community will produce about 2,500 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,500 pounds in years of below-normal precipitation.

Where the Trembles soil is forested, the potential native understory beneath a fully stocked stand of plains cottonwood is prairie sandreed, Canada wildrye, slender wheatgrass, common chokecherry, snowberry, Woods rose, field horsetail, green ash, Rocky Mountain juniper, poison-ivy, American licorice, and western meadowrue. Yield decreases and the composition of the understory changes as the overstory tree canopy increases.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This unit is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, Rocky Mountain juniper, cottonwood, and blue spruce. Suitable shrubs are Siberian peashrub, American plum, Tatarian honeysuckle, common chokecherry, Nanking cherry, and lilac. The risk of soil blowing can be reduced by cultivating only between the rows of windbreaks.

Forest management.—This unit is suited to plains cottonwood. The site index for plains cottonwood is 65. The potential annual production per acre is about 30 cubic feet or 160 board feet (Scribner rule). Potential production is for an even-aged, fully stocked stand of trees.

The main forest management concerns on this unit are the difficulty of reestablishing plains cottonwood, soil compaction, and the poor trafficability of the Havrelon soil. The understory vegetation competes vigorously with tree seedlings for the limited amount of available water. Reduction of competing vegetation encourages adequate natural regeneration and the survival of planted seedlings. Shelterwood and selection silvicultural harvesting systems improve regeneration. The Havrelon soil has low strength, which results in poor trafficability. Both soils are susceptible to compaction if heavy equipment is used when the soils are wet. Operating equipment only when the soils are dry or frozen can overcome this limitation.

Homesite development.—If this unit is used for homesite development, it is limited mainly by shrink-swell potential and low strength of the Havrelon soil and by frost action. If buildings are constructed on the Havrelon soil, properly design foundations and footings and divert runoff away from buildings to help prevent structural

damage as a result of shrinking and swelling. Low soil strength and frost action can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclasses IIIe, nonirrigated, and IIe, irrigated. The Havrelon soil is in Silty range site, 10- to 14-inch precipitation zone, and the Trembles soil is in Sandy range site, 10- to 14-inch precipitation zone.

30—Hillon loam, 8 to 15 percent slopes. This deep, well drained soil is on uplands. It is in the southwestern part of Roosevelt County. It formed in glacial till. Slope is 8 to 15 percent. Slopes are mainly 50 to 500 feet long. Elevation is 2,000 to 2,500 feet.

Included in this unit are small areas of Telstad and Evanston soils and alluvial soils, in drainageways, that have a thicker and darker colored surface layer than does this Hillon soil. These areas do not adversely affect the use and management of this unit for nonirrigated cultivated crops. Also included are small areas of Hillon gravelly loam and Hillon soils that have slopes of more than 15 percent. The areas of Hillon gravelly loam may interfere with tillage. The areas of Hillon soils that have slopes of more than 15 percent can be farmed around.

Typically, the Hillon soil has a surface layer of light brownish gray loam 8 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is medium to rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

This soil is used mainly as rangeland. It is also used for nonirrigated cultivated crops. The main nonirrigated crop is spring wheat.

Crop management.—This soil is poorly suited to nonirrigated cultivated crops. It is limited mainly by the hazards of water erosion and soil blowing. All tillage should be on the contour or across the slope. Keeping tillage at a minimum maintains tilth, increases the water intake rate, and reduces the risk of erosion. The surface layer of this soil is high in content of lime and low in content of organic matter. Crops respond well to the application of phosphorus and nitrogen. Using green manure crops, barnyard manure, and crop residue increases organic matter content and fertility. On long slopes, chiseling the stubble in fall, either on the contour or across the slope, slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Some areas of this soil have glacial stones and boulders on the surface. In most cultivated areas, these stones and boulders have been removed and piled along field borders.

Range management.—The potential plant community is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, and winterfat. If the range is excessively grazed, these plants decrease and needleandthread, little porcupinegrass, blue grama, junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as clubmoss, cheatgrass, sixweeks fescue, and weedlike forbs may invade. The potential plant community will produce about 1,200 pounds of air-dry vegetation per acre in years of above-normal precipitation and 500 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Where clubmoss and blue grama are the dominant vegetation, practices such as pitting, furrowing, or chiseling can be used to improve areas of depleted rangeland. Such practices increase the water intake rate, reduce plant competition, and allow the more desirable native plants to increase. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. The included alluvial soils produce a significant amount of the total forage on this unit.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, and common chokecherry.

Homesite development.—If this soil is used for homesite development, it is limited mainly by slope, low soil strength, and slow permeability. If this soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field. The steepness of slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Effluent from absorption fields can surface in downslope areas and create a hazard to health. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome this limitation.

This map unit is in capability subclass IVe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

31—Hillon loam, 15 to 45 percent slopes. This deep, well drained soil is on uplands in the southwestern part of Roosevelt County. The soil formed in glacial till. Slope is 15 to 45 percent. Slopes are mainly 50 to 250 feet long. Elevation is 2,000 to 2,500 feet.

Included in this unit are small areas of Evanston soils, Hillon gravelly loam, Hillon clay loam, and alluvial soils, in drainageways, that have a thicker and darker colored

surface layer than does the Hillon soil. These areas do not adversely affect the use and management of this unit as rangeland. Also included are small areas of Tinsley soils. The areas of Tinsley soils produce less vegetation than the Hillon soil.

Typically, the Hillon soil has a surface layer of light brownish gray loam 7 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 15 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

This soil is used mainly as rangeland.

Crop management.—This soil is poorly suited to cultivated crops. It is limited mainly by slope.

Range management.—The potential plant community is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, and plains muhly. If the range is excessively grazed, these plants decrease and needleandthread, little porcupinegrass, blue grama, threadleaf sedge, and junegrass increase. If excessive grazing continues, plants such as clubmoss, broom snakeweed, and weedlike forbs may invade. The potential plant community will produce about 800 pounds of air-dry vegetation per acre in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas. Trails or walkways can be constructed to encourage livestock grazing in areas where access is limited. Mechanical treatment practices are not practical. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. The included alluvial soils produce a significant amount of the total forage on this unit.

Windbreak management.—This soil is poorly suited to windbreaks because of slope.

Homesite development.—The main limitation for homesite development is steepness of slope.

This map unit is in capability subclass VIe, nonirrigated. It is in Thin Hilly range site, 10- to 14-inch precipitation zone.

32—Hillon-Tinsley complex, 8 to 15 percent slopes. This map unit is on uplands in the southwestern part of Roosevelt County. Slope is 8 to 15 percent. Slopes are mainly 50 to 500 feet long. Elevation is 2,000 to 2,500 feet.

This unit is about 75 percent Hillon loam and 15 percent Tinsley very gravelly sandy loam.

Included in this unit are small areas of Evanston soils, Hillon soils that have a clay loam surface layer, and alluvial soils, in drainageways, that have a thicker and darker colored surface layer than does the Hillon soil. These areas do not adversely affect the use and management of this unit for nonirrigated cultivated crops. Also included are small areas of Wabek soils, Hillon soils that have a gravelly loam surface layer, and Hillon and Tinsley soils that have slopes of more than 15 percent. The Wabek and Tinsley soils are very droughty. Addition of barnyard manure helps to overcome this limitation. The areas of Hillon gravelly loam may interfere with tillage. The areas of Hillon and Tinsley soils that have slopes of more than 15 percent can be farmed around. Included areas make up about 10 percent of the total acreage.

The Hillon soil is deep and well drained. It formed in glacial till. Typically, the Hillon soil has a surface layer of light brownish gray loam 8 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is medium to rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

The Tinsley soil is deep, excessively drained, and very droughty. It formed in outwash. Typically, the Tinsley soil has a surface layer of brown very gravelly sandy loam 3 inches thick. The underlying material to a depth of 60 inches or more is pale brown very gravelly sand.

Permeability is rapid, and available water capacity is very low. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

Most areas of this unit are used as rangeland and for nonirrigated cultivated crops. A few areas are used as a source of sand and gravel. The main nonirrigated crops are spring wheat and barley.

Crop management.—This unit is poorly suited to nonirrigated cultivated crops. It is limited mainly by the hazards of water erosion and soil blowing on the Hillon soil and the droughtiness and poor soil tilth of the Tinsley soil. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. The amount of moisture in the soil can be increased by using tall grass barriers to minimize evaporation and trap snow. Return of crop residue helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces water erosion. Additions of barnyard manure improve the available water capacity. Crops respond to phosphate and nitrogen fertilizer.

Range management.—The potential plant community on the Hillon soil is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, and plains muhly. If the range is excessively grazed, these plants decrease and needleandthread, little porcupinegrass, blue grama, threadleaf sedge, and junegrass increase. If excessive grazing continues, plants such as clubmoss, broom snakeweed, and weedlike forbs may invade. The potential plant community will produce about 1,200 pounds of air-dry vegetation per acre in years of above-normal precipitation and 500 pounds in years of below-normal precipitation.

The potential plant community on the Tinsley soil is mainly bluebunch wheatgrass, needleandthread, western wheatgrass, and plains muhly. If the range is excessively grazed, bluebunch wheatgrass, western wheatgrass, and plains muhly decrease and needleandthread, blue grama, perennial forbs, and fringed sagewort increase. If excessive grazing continues, plants such as clubmoss, broom snakeweed, and weedlike forbs may invade. The potential plant community will produce about 900 pounds of air-dry vegetation per acre in years of above-normal precipitation and 450 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. The included alluvial soils produce a significant amount of the total forage on this unit.

Windbreak management.—The Hillon soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, and common chokecherry. The Tinsley soil is poorly suited to windbreaks because it has very low available water capacity.

Homesite development.—If the Hillon soil is used for homesite development, it is limited mainly by slope, low soil strength, slow permeability, and the hazard of cutbanks caving in. If the soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field. Low soil strength can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome this limitation. If the Tinsley soil is used for homesite development, it is limited mainly by slope, the hazard of cutbanks caving in, and the rapid permeability. Because the soil is rapidly permeable, effluent from septic tank absorption fields may contaminate ground water.

The steepness of slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Effluent from absorption fields can surface in downslope areas and create a hazard to health. Cutbanks are not stable and are subject to slumping.

This map unit is in capability subclass IVe, nonirrigated. The Hillon soil is in Silty range site, 10- to 14-inch precipitation zone, and the Tinsley soil is in Gravel range site, 10- to 14-inch precipitation zone.

33—Hillon-Tinsley complex, 15 to 45 percent slopes. This map unit is on uplands in the southwestern part of Roosevelt County. Slope is 15 to 45 percent. Slopes are mainly 50 to 250 feet long. Elevation is 2,000 to 2,500 feet.

This unit is about 75 percent Hillon loam and 15 percent Tinsley very gravelly sandy loam.

Included in this unit are small areas of Hillon soils that have a gravelly loam or clay loam surface layer; Wabek soils; and alluvial soils, in drainageways, that have a thicker and darker colored surface layer than does the Hillon soil. Also included are small areas of Tinsley soils that have a loam, gravelly loam, or gravelly sandy loam surface layer. These included areas do not adversely affect the use and management of this unit as rangeland. Included areas make up about 10 percent of the total acreage.

The Hillon soil is deep and well drained. It formed in glacial till. Typically, the Hillon soil has a surface layer of light brownish gray loam 7 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 15 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

The Tinsley soil is deep, excessively drained, and very droughty. It formed in outwash. Typically, the Tinsley soil has a surface layer of brown very gravelly sandy loam 3 inches thick. The underlying material to a depth of 60 inches or more is pale brown very gravelly sand.

Permeability is rapid, and available water capacity is very low. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is 60 inches or more. Runoff is slow to medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

Most areas of this unit are used as rangeland. A few areas are used as a source of sand and gravel.

Crop management.—This unit is poorly suited to cultivated crops. It is limited mainly by slope.

Range management.—The potential plant community on the Hillon soil is mainly bluebunch wheatgrass, western wheatgrass, plains muhly, and green needlegrass. If the range is excessively grazed, these plants decrease and needleandthread, little porcupinegrass, blue grama, threadleaf sedge, and junegrass increase. If excessive grazing continues, plants such as clubmoss, broom snakeweed, and weedlike forbs may invade. The potential plant

community will produce about 800 pounds of air-dry vegetation per acre in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

The potential plant community on the Tinsley soil is mainly bluebunch wheatgrass, needleandthread, western wheatgrass, and plains muhly. If the range is excessively grazed, bluebunch wheatgrass, western wheatgrass, and plains muhly decrease and needleandthread, blue grama, perennial forbs, and fringed sagewort increase. If excessive grazing continues, plants such as clubmoss, broom snakeweed, and weedlike forbs may invade. The potential plant community will produce about 750 pounds of air-dry vegetation per acre in years of above-normal precipitation and 350 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas. Trails or walkways can be constructed to encourage livestock grazing in areas where access is limited. Mechanical treatment practices are not practical. The included alluvial soils produce a significant amount of the total forage on this unit.

Windbreak management.—This unit is poorly suited to windbreaks because of slope and the very low available water capacity of the Tinsley soil.

Homesite development.—The main limitation for homesite development is steepness of slope.

This map unit is in capability subclass VIe, nonirrigated. The Hillon soil is in Thin Hilly range site, 10- to 14-inch precipitation zone, and the Tinsley soil is in Gravel range site, 10- to 14-inch precipitation zone.

34—Lallie silty clay, saline, 0 to 2 percent slopes. This deep, very poorly drained, salt-affected soil is in oxbows and lake basins on flood plains throughout the survey area. It formed in alluvium. The soil is subject to frequent periods of flooding. Slope is 0 to 2 percent. Slopes are mainly 25 to 100 feet long. Elevation is 1,875 to 2,900 feet.

Included in this unit are small areas of Bowdoin and Lohler soils and Lallie soils that have a clay surface layer. Also included are small areas of soils along the Big Muddy Creek that are similar to the Lallie soil but have a water table at a depth of 18 to 36 inches. These included areas do not adversely affect the use and management of this unit as rangeland and for grass hay. Also included are areas of Fluvaquents, ponded. These areas are usually too wet for use as rangeland and for grass hay.

Typically, the Lallie soil has a surface layer of gray silty clay 3 inches thick. The upper 17 inches of the underlying material is light gray clay, and the lower part to a depth of 60 inches or more is gray silty clay.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is 60 inches or more. Runoff is ponded, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table ranges 12 inches above the surface to 18 inches below the surface from April through June. This soil is subject to frequent periods of flooding from April through June. It is calcareous throughout. The soil is moderately salt-affected to strongly salt-affected at a depth of about 3 inches.

This soil is used mainly as rangeland and for grass hay.

Crop management.—This soil is poorly suited to cultivated crops. It is limited mainly by the hazard of flooding, the high water table, and moderate to strong salinity.

Range management.—The potential plant community is mainly tall reedgrasses, prairie cordgrass, American sloughgrass, and tall sedges. If the range is excessively grazed, these plants decrease and low sedges, tufted hairgrass, Baltic rush, inland saltgrass, western wheatgrass, and perennial forbs increase. If excessive grazing continues, plants such as curly dock, foxtail barley, Kentucky bluegrass, and Canada thistle may invade. The potential plant community will produce about 3,400 pounds of air-dry vegetation per acre in years of above-normal precipitation and 2,600 pounds in years of below-normal precipitation. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

Windbreak management.—This soil is poorly suited to windbreaks because of the high water table and moderate to strong salinity.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by the frequent periods of flooding and the high water table.

This map unit is in capability subclass VIIw, nonirrigated. It is in Wet Meadow range site, 10- to 14-inch precipitation zone.

35—Lihen sandy loam, 2 to 8 percent slopes. This deep, somewhat excessively drained, droughty soil is on terraces and uplands in most areas of Daniels County and the eastern one-half of Roosevelt County. It formed in alluvial and eolian deposits. Slope is 2 to 8 percent. Slopes are mainly 75 to 500 feet long. Elevation is 2,000 to 3,000 feet.

Included in this unit are small areas of Tally and Blanchard soils and Parshall sandy loam. Also included are small areas of Turner soils in the southwestern part of Daniels County. These included areas do not adversely affect the use and management of this unit as rangeland.

Typically, the Lihen soil has a surface layer of dark grayish brown and grayish brown sandy loam 9 inches thick. The upper 15 inches of the underlying material is grayish brown loamy sand, and the lower part to a depth of 60 inches or more is light brownish gray sand.

Permeability is rapid, and available water capacity is low. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is calcareous below a depth of about 10 to 24 inches.

Most areas of this soil are used as rangeland. A few areas are used for nonirrigated cultivated crops. The main nonirrigated crops are spring wheat and barley.

Crop management.—This soil is poorly suited to nonirrigated cultivated crops. It is limited mainly by droughtiness and the hazard of soil blowing. Annual cropping is feasible. The effectiveness of summer fallow for storing moisture is limited because of the low available water capacity. Additions of barnyard manure improve the available water capacity. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. Crops respond to phosphate and nitrogen fertilizer.

Range management.—The potential plant community is mainly needleandthread, prairie sandreed, Indian ricegrass, and thickspike wheatgrass. If the range is excessively grazed, prairie sandreed, Indian ricegrass, and thickspike wheatgrass decrease and needleandthread, blue grama, threadleaf sedge, and fringed sagewort increase. If excessive grazing continues, plants such as cheatgrass, Japanese brome, broom snakeweed, plains pricklypear, and weedlike forbs may invade. The potential plant community will produce about 1,600 pounds of air-dry vegetation per acre in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub and silver buffaloberry. The risk of soil blowing can be reduced by cultivating only between the rows of windbreaks.

Homesite development.—If this soil is used for homesite development, it is limited mainly by the rapid permeability and susceptibility to slumping. Cutbanks are not stable and are subject to slumping. Because this soil is rapidly permeable, effluent from septic tank absorption fields may contaminate ground water.

This map unit is in capability subclass IVe, nonirrigated. It is in Sandy range site, 10- to 14-inch precipitation zone.

36—Lohler silty clay, 0 to 2 percent slopes. This deep, moderately well drained soil is on the flood plains of the tributaries of the Missouri River. It is throughout the survey area except in the southwestern part of Roosevelt County. It formed in alluvium and is subject to flooding. Slope is 0 to 2 percent. Slopes are mainly 100 to 300 feet long. Elevation is 1,875 to 2,500 feet.

Included in this unit are small areas of Havrelon soils and Lohler soils that have a silt loam or silty clay loam surface layer. These areas do not adversely affect the use and management of this unit for nonirrigated cultivated crops. Also included are small areas of saline Lallie and Lohler soils. These soils are low in productivity because of the content of salts and wetness of the Lallie soil.

Typically, the Lohler soil, where mixed to a depth of 7 inches, has a surface layer of grayish brown silty clay. The upper 10 inches of the underlying material is light brownish gray silty clay, the next 22 inches is light brownish gray clay, and the lower part to a depth of 60 inches or more is light brownish gray silty clay.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. Channeling and deposition are common along streambanks. This soil is subject to occasional periods of flooding from April through June. The soil is calcareous throughout.

This soil is used mainly for nonirrigated cultivated crops, for grass hay, and as rangeland. The main nonirrigated crops are spring wheat and barley.

Crop management.—If this soil is used for nonirrigated cultivated crops, it is limited mainly by the occasional periods of flooding in spring. Flooding may delay planting.

Range management.—The potential plant community is mainly western wheatgrass, porcupinegrass, green needlegrass, and winterfat. If the range is excessively grazed, these plants decrease and needleandthread, perennial forbs, fringed sagewort, and silver sagebrush increase. If excessive grazing continues, plants such as Kentucky bluegrass, Canada bluegrass, and weedlike forbs may invade. The potential plant community will produce about 3,200 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,800 pounds in years of below-normal precipitation.

Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Siberian elm, cottonwood, ponderosa pine, green ash, and blue spruce. Suitable shrubs are Siberian peashrub, American plum, Tatarian honeysuckle, and common chokecherry.

Homesite development.—This soil is poorly suited to homesite development mainly because of the hazard of flooding.

This map unit is in capability subclass IIIw, nonirrigated. It is in Overflow range site, 10- to 14-inch precipitation zone.

37—Lohler silty clay, protected, 0 to 2 percent slopes. This deep, moderately well drained soil is on the flood plain of the Missouri River. It is on the parts of the Missouri River flood plain that are protected from flooding by Fort Peck Dam. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly 50 to 250 feet long. Elevation is 1,875 to 2,000 feet.

Included in this unit are small areas of protected Havrelon and Lohler soils that have a silt loam or silty clay loam surface layer. These areas do not adversely affect the use and management of this unit for cultivated crops. Also included are small areas of protected Bowdoin soils, Lallie soils that are wet and are moderately saline to strongly saline, and protected Lohler soils that are saline. The small included areas of Bowdoin and Lohler soils are low in productivity, and the Lallie soils are difficult to work in spring.

Typically, the Lohler soil, where mixed to a depth of 7 inches, has a surface layer of grayish brown silty clay. The upper 10 inches of the underlying material is light brownish gray silty clay, the next 22 inches is light brownish gray clay, and the lower part to a depth of 60 inches or more is light brownish gray silty clay.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is calcareous throughout.

This soil is used mainly for nonirrigated cultivated crops, as rangeland, and for grass hay. It is also used for irrigated cultivated crops and as woodland. The main nonirrigated crops are alfalfa hay, spring wheat, and barley. The main irrigated crops are alfalfa hay and grass-legume hay.

Crop management.—If this soil is used for nonirrigated cultivated crops, it is limited mainly by the hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. This soil is difficult to till when it is dry, and it is subject to clodding and compaction if it is tilled when wet. The content of soil moisture is optimum for tillage for only a short period. Leaving crop residue on or near the surface conserves moisture, increases the water intake rate, and improves tilth.

This soil is suited to irrigated crops. Furrow, border, corrugation, and sprinkler irrigation systems are suited to the soil. Because of the slow permeability, water should be applied at a slow rate over a long period to insure that the root zone is properly wetted.

Range management.—Where the Lohler soil is grassland, the potential plant community is mainly western wheatgrass, winterfat, green needlegrass, and plains muhly. If the range is excessively grazed, these plants decrease and plains reedgrass, Sandberg bluegrass, silver sagebrush, and blue grama increase. If excessive grazing continues, plants such as broom snakeweed, plains pricklypear, clubmoss, sweetclover, and weedlike forbs may invade. The potential plant community will produce about 1,800 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,100 pounds in years of below-normal precipitation.

Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Where the Lohler soil is forested, the potential native understory plants beneath a fully stocked stand of plains cottonwood is western wheatgrass, green needlegrass, rose, snowberry, common chokecherry, prairie junegrass, poison-ivy, American licorice, green ash, Saskatoon serviceberry, redosier dogwood, and silver buffaloberry. Yield decreases and the composition of the understory changes as the overstory tree canopy increases.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Siberian elm, cottonwood, green ash, ponderosa pine, and blue spruce. Suitable shrubs are Siberian peashrub, American plum, Tatarian honeysuckle, and common chokecherry.

Forest management.—This soil is suited to plains cottonwood. The site index for plains cottonwood is 65. The potential annual production per acre is about 30 cubic feet or 160 board feet (Scribner rule). Potential production is for an even-aged, fully stocked stand of trees.

The main limitations for timber management are the difficulty of reestablishing plains cottonwood and soil compaction. The understory vegetation competes vigorously with tree seedlings for the limited amount of available water. Reduction of competing vegetation encourages adequate natural regeneration and the survival of planted seedlings. Shelterwood and selection silvicultural harvesting systems improve regeneration. The soil has low strength when wet, which results in poor trafficability and the possibility of soil compaction when heavy equipment is used to yard logs. Operating equipment only when the soil is dry or frozen can overcome this limitation.

Homesite development.—If this soil is used for homesite development, it is limited mainly by the slow permeability, low soil strength, and shrink-swell potential. If the soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and

road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIs, nonirrigated and irrigated. It is in Clayey range site, 10- to 14-inch precipitation zone.

38—Martinsdale loam, 1 to 8 percent slopes. This deep, well drained soil is on fans and terraces on uplands. It is mostly in the western half of Daniels County and the northwestern part of Roosevelt County. It formed in alluvium. Slope is 1 to 8 percent. Slopes are mainly 250 to 1,000 feet long. Elevation is 2,000 to 3,100 feet.

Included in this unit are small areas of Farnuf soils. These areas do not adversely affect the use and management of this unit for nonirrigated cultivated crops. Also included are small areas of Tally and Turner soils and Martinsdale soils that have a sandy loam surface layer. These soils require careful management because they are highly susceptible to soil blowing. Soil blowing can be reduced by using all crop residue and practicing minimum tillage. The Turner and Tally soils are also droughty. Additions of barnyard manure improve the available water capacity.

Typically, the Martinsdale soil has a surface layer of grayish brown loam 6 inches thick. The subsoil is pale brown clay loam 15 inches thick. The substratum to a depth of 60 inches or more is very pale brown loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 36 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This soil is used mainly for nonirrigated cultivated crops and as rangeland. The main nonirrigated crops are spring wheat and barley.

Crop management.—If this soil is used for nonirrigated cultivated crops, it is limited by the hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing.

Range management.—The potential plant community is mainly bluebunch wheatgrass, western wheatgrass, winterfat, and green needlegrass. If the range is excessively grazed, these plants decrease and little porcupinegrass, blue grama, junegrass, needleandthread, and threadleaf sedge increase. If excessive grazing continues, plants such as cheatgrass, sixweeks fescue, clubmoss, and weedlike forbs may invade. The potential plant community will produce about 1,700 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, common chokecherry, lilac, and silver buffaloberry.

Homesite development.—If this soil is used for homesite development, it is limited mainly by the moderately slow permeability and shrink-swell potential. If the soil is used for septic tank absorption fields, the limitation of moderately slow permeability can be overcome by increasing the size of the absorption field. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. Shrinking and swelling can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome this limitation.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

39—McKenzie clay loam, 0 to 2 percent slopes. This deep, poorly drained, nearly level soil is in depressional areas and lake basins on uplands. It is throughout the survey area except in the southwestern part of Roosevelt County. It formed in alluvium and is subject to ponding. Slope is 0 to 2 percent. Slopes are mainly 25 to 200 feet long. Elevation is 2,000 to 3,000 feet.

Included in this unit are small areas of Nishon and Savage soils and McKenzie soils that have a silty clay loam or silty clay surface layer. These areas do not adversely affect the use and management of this unit as rangeland.

Typically, the McKenzie soil has a surface layer of grayish brown clay loam 2 inches thick. The upper 14 inches of the subsoil is grayish brown silty clay, and the lower 10 inches is dark gray silty clay. The upper 6 inches of the substratum is gray silty clay, and the lower part to a depth of 60 inches or more is dark gray silty clay.

Permeability is very slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is 60 inches or more. Runoff is ponded, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table ranges from 12 inches above the surface to 12 inches below the surface from April through June.

This soil is used mainly for grass hay and as rangeland.

Crop management.—This soil is poorly suited to cultivated crops. It is limited mainly by the periods of ponding.

Range management.—The potential plant community is mainly western wheatgrass, sedges, ticklegrass, and

perennial forbs. If the range is excessively grazed, western wheatgrass and sedges decrease and ticklegrass, blue grama, perennial forbs, and fringed sagewort increase. If excessive grazing continues, plants such as foxtail barley and curly dock may invade. The potential plant community will produce about 3,100 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,700 pounds in years of below-normal precipitation.

Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This soil is poorly suited to windbreaks because of the periods of ponding.

Homesite development.—This soil is poorly suited to homesite development. It is limited mainly by the periods of ponding.

This map unit is in capability subclass Vw, nonirrigated. It is in Overflow range site, 10- to 14-inch precipitation zone.

40—Nishon clay loam, 0 to 2 percent slopes. This deep, somewhat poorly drained or poorly drained soil is in depressional areas and lake basins on uplands. It is throughout the survey area except in the southwestern part of Roosevelt County. It formed in alluvium and is subject to ponding. Slope is 0 to 2 percent. Slopes are mainly 25 to 100 feet long. Elevation is 2,400 to 3,000 feet.

Included in this unit are small areas of Savage soils and Nishon soils that have a loam surface layer. These areas do not adversely affect the use and management of this unit for nonirrigated cultivated crops. Also included are small areas of McKenzie and Dimmick soils. The McKenzie and Dimmick soils remain ponded longer than the Nishon soil, which often prevents seeding to nonirrigated cultivated crops.

Typically, the Nishon soil, where mixed to a depth of 7 inches, has a surface layer of light brownish gray clay loam. The upper 10 inches of the subsoil is gray clay, and the lower 4 inches is grayish brown clay loam. The upper 26 inches of the substratum is light brownish gray clay, and the lower part to a depth of 60 inches or more is light brownish gray clay loam.

Permeability is very slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. A seasonal high water table ranges from 12 inches above the surface to 36 inches below the surface from April through June. This soil is subject to frequent periods of ponding from April through June.

This soil is used mainly for nonirrigated cultivated crops, for grass hay, and as rangeland. The main nonirrigated crops are spring wheat and barley.

Crop management.—This soil is poorly suited to nonirrigated cultivated crops. It is limited mainly by ponding.

Range management.—The potential plant community is mainly western wheatgrass, sedges, ticklegrass, and perennial forbs. If the range is excessively grazed, western wheatgrass and sedges decrease and ticklegrass, blue grama, perennial forbs, and fringed sagewort increase. If excessive grazing continues, plants such as foxtail barley and curly dock may invade. The potential plant community will produce about 3,000 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,600 pounds in years of below-normal precipitation.

Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This soil is poorly suited to windbreaks because of the periods of ponding.

Homesite development.—This soil is poorly suited to homesite development because of ponding.

This map unit is in capability subclass Vw, nonirrigated. It is in Overflow range site, 10- to 14-inch precipitation zone.

41—Nobe silty clay, flooded, 0 to 2 percent slopes. This deep, moderately well drained soil is on the flood plains of the tributaries of the Missouri River. It formed in alluvium. The soil is strongly affected by sodium and salt and is subject to flooding. Slope is 0 to 2 percent. Slopes are mainly 50 to 250 feet long. Elevation is 2,000 to 2,800 feet.

Included in this unit are small areas of Farnuf, Adger, and Lallie soils and Fluvaquents, saline. These areas do not adversely affect the use and management of this unit as rangeland.

Typically, the Nobe soil, where mixed to a depth of 7 inches, has a surface layer of grayish brown silty clay. The substratum to a depth of 60 inches or more is grayish brown silty clay.

Permeability is very slow. Available water capacity is moderate because of the content of salts. Effective rooting depth is limited by salts at a depth of 10 inches. Where this soil is under native vegetation, the average annual wetting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. The soil is subject to occasional periods of flooding from April through June. The soil is strongly sodium-affected at a depth of about 2 inches, and it is strongly salt-affected at a depth of about 5 inches.

This soil is used mainly as rangeland.

Crop management.—This soil is poorly suited to cultivated crops. It is limited mainly by the content of sodium and salts and the hazard of flooding in spring.

Range management.—The potential plant community is mainly alkali cordgrass, Nuttall alkaligrass, alkali sacaton, and Nuttall saltbush. If the range is excessively grazed, these plants decrease and inland saltgrass, bottlebrush squirreltail, and greasewood increase. If excessive grazing continues, plants such as foxtail barley and weedlike forbs may invade. The potential plant community will produce about 1,100 pounds of air-dry vegetation per acre in years of above-normal precipitation and 500 pounds in years of below-normal precipitation.

Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. This soil is not suited to seeding because of the content of sodium and salts.

Windbreak management.—This soil is poorly suited to windbreaks because of the content of sodium and salts.

Homesite development.—This soil is poorly suited to homesite development mainly because of occasional flooding.

This map unit is in capability subclass VIIs, nonirrigated. It is in Saline Lowland range site, 10- to 14-inch precipitation zone.

42—Parshall sandy loam, 0 to 4 percent slopes. This deep, well drained soil is in depressional areas on uplands. It is throughout the survey area except in the southwestern part of Roosevelt County. It formed in local alluvium. Slope is 0 to 4 percent. Slopes are mainly 200 to 600 feet long. Elevation is 2,000 to 3,000 feet.

Included in this unit are small areas of Bowbells and Dooley soils. These areas do not adversely affect the use and management of this unit for nonirrigated cultivated crops. Also included are small areas of Lihen and Tally soils and Parshall soils that have a silty substratum. Droughtiness is the main limitation of the Lihen and Tally soils. Addition of barnyard manure helps to overcome this limitation. The Parshall soils are wet in spring, which may interfere with tillage.

Typically, the Parshall soil has a surface layer of dark brown sandy loam 3 inches thick. The upper 9 inches of the subsoil is dark brown sandy loam, and the lower 13 inches is dark grayish brown sandy loam. The upper 7 inches of the substratum is brown loamy sand, and the lower part to a depth of 60 inches or more is grayish brown loamy sand.

Permeability is moderately rapid. Available water capacity is moderate. This soil receives additional water as runoff from adjacent areas. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This soil is used mainly for nonirrigated cultivated crops, for grass hay, and as rangeland. The main nonirrigated crops are spring wheat and barley.

Crop management.—If this soil is used for nonirrigated cultivated crops, it is limited by the hazard of soil blowing. This soil produces high yields of nonirrigated cultivated crops because of the additional water received as runoff from adjacent areas. It can be cropped annually. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. Crops respond to phosphate and nitrogen fertilizer.

Range management.—The potential plant community is mainly prairie sandreed, needleandthread, Indian ricegrass, and thickspike wheatgrass. If the range is excessively grazed, prairie sandreed, Indian ricegrass, and thickspike wheatgrass decrease and needleandthread, blue grama, fringed sagewort, and threadleaf sedge increase. If excessive grazing continues, plants such as cheatgrass, Japanese brome, broom snakeweed, plains pricklypear, and weedlike forbs may invade. The potential plant community will produce about 2,500 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,500 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Siberian elm, cottonwood, ponderosa pine, green ash, and blue spruce. Suitable shrubs are Siberian peashrub, American plum, Tatarian honeysuckle, Russian-olive, and common chokecherry. The risk of soil blowing can be reduced by cultivating only between the rows of windbreaks.

Homesite development.—If this soil is used for homesite development, it is limited mainly by frost action and susceptibility to slumping. Cutbanks are not stable and are subject to slumping. Frost action can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome this limitation. Because this soil receives additional water as runoff from adjacent areas, it may be necessary to divert this runoff away from buildings and roads.

This map unit is in capability subclass IVe, nonirrigated. It is in Sandy range site, 10- to 14-inch precipitation zone.

43—Parshall sandy loam, silty substratum, 0 to 4 percent slopes. This deep, moderately well drained soil is in depressional areas on uplands. It is throughout the survey area except in the southwestern part of Roosevelt County. It formed in local alluvium. Slope is 0 to 4 percent. Slopes are mainly 100 to 500 feet long. Elevation is 2,000 to 3,000 feet.

Included in this unit are small areas of Bowbells, Parshall, and Dooley soils. These areas do not adversely

affect the use and management of this unit for nonirrigated cultivated crops. Also included are small areas of Lihen and Tally soils. Droughtiness is the main limitation of these soils. Addition of barnyard manure helps to overcome this limitation.

Typically, the Parshall soil, silty substratum, has a surface layer of dark grayish brown sandy loam 12 inches thick. The subsoil is dark grayish brown sandy loam 18 inches thick. The upper 10 inches of the substratum is dark grayish brown sandy loam, and the lower part to a depth of 60 inches or more is white silt loam.

Permeability is moderately rapid to a depth of about 40 inches and slow below this depth. Available water capacity is high. This soil receives additional water as runoff from adjacent areas. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. A seasonal high water table is at a depth of 40 to 60 inches from April to September.

This soil is used mainly for nonirrigated cultivated crops, for grass hay, and as rangeland. The main nonirrigated crops are spring wheat and barley.

Crop management.—This soil produces high yields of nonirrigated cultivated crops because of the additional water received as runoff from adjacent areas. It could be cropped annually, but wetness in spring may interfere with tillage. The hazard of soil blowing is also a limitation of this soil for cultivated crops. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. Crops respond to phosphate and nitrogen fertilizer.

Range management.—The potential plant community is mainly slender wheatgrass, prairie cordgrass, tall reedgrasses, and tall sedges. If the range is excessively grazed, these plants decrease and western wheatgrass, tufted hairgrass, low sedges, and perennial forbs increase. If excessive grazing continues, plants such as foxtail barley, Kentucky bluegrass, redtop, and Canada thistle may invade. The potential plant community will produce about 4,000 pounds of air-dry vegetation per acre in years of above-normal precipitation and 2,500 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This unit is suited to windbreaks. Suitable trees for planting are Siberian elm, cottonwood, Russian-olive, ponderosa pine, green ash, and blue spruce. Suitable shrubs are Siberian peashrub, American plum, Tatarian honeysuckle, and common chokecherry. The risk of soil blowing can be reduced by cultivating only between the rows of windbreaks.

Homesite development.—This unit is poorly suited to homesite development. It is limited mainly by wetness and the slow permeability below a depth of about 40 inches.

This map unit is in capability subclass IVe, nonirrigated. It is in Subirrigated range site, 10- to 14-inch precipitation zone.

44—Phillips-Elloam clay loams, 2 to 8 percent slopes. This map unit is on glaciated uplands in the southwestern and central parts of Roosevelt County. Slope is 2 to 8 percent. Slopes are mainly 100 to 500 feet long. Elevation is 2,200 to 2,500 feet.

This unit is about 60 percent Phillips clay loam and 30 percent Elloam clay loam.

Included in this unit are small areas of Hillon, Telstad, and Williams soils and Phillips and Elloam soils that have slopes of less than 2 percent. Included areas make up about 10 percent of the total acreage. These included areas do not adversely affect the use and management of this unit as rangeland.

The Phillips soil is deep and well drained. It formed in glacial till. Typically, the surface layer, where mixed to a depth of 7 inches, is pale brown clay loam. The upper 8 inches of the subsoil is grayish brown clay, and the lower 10 inches is grayish brown clay loam. The substratum to a depth of 60 inches or more is grayish brown clay loam.

Permeability is very slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is slow to medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Elloam soil is deep, well drained, and droughty. It formed in glacial till. Typically, the surface layer, where mixed to a depth of 7 inches, is light gray clay loam. The upper 5 inches of the subsoil is brown and light brownish gray clay, and the lower 8 inches is light brownish gray clay loam. The substratum to a depth of 60 inches or more is light brownish gray clay loam.

Permeability is very slow. Available water capacity is moderate because of the effects of the sodium and salts. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. This soil is strongly sodium-affected at a depth of about 2 inches, and it is moderately salt-affected at a depth of about 12 inches.

Most areas of this unit are used as rangeland. A few areas are used for nonirrigated cultivated crops. The main nonirrigated crops are spring wheat and barley.

Crop management.—If this unit is used for nonirrigated cultivated crops, it is limited by the hazards of water erosion and soil blowing. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. The amount of moisture

in the soil can be increased by using tall grass barriers to minimize evaporation and trap snow. Return of crop residue helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces water erosion. Because of the content of sodium and salts, crop yields are low on the Elloam soil. Yields can be increased by addition of gypsum and by plowing to a depth of 2 to 3 feet.

Range management.—The potential plant community on the Phillips soil is mainly western wheatgrass, green needlegrass, winterfat, and plains muhly. If the range is excessively grazed, these plants decrease and plains reedgrass, Sandberg bluegrass, blue grama, and silver sagebrush increase. If excessive grazing continues, plants such as broom snakeweed, plains pricklypear, clubmoss, sweetclover, and weedlike forbs may invade. The potential plant community will produce about 1,500 pounds of air-dry vegetation per acre in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The potential plant community on the Elloam soil is mainly western wheatgrass, green needlegrass, Nuttall saltbush, and winterfat. If the range is excessively grazed, these plants decrease and plains reedgrass, blue grama, Sandberg bluegrass, silver sagebrush, and greasewood increase. If excessive grazing continues, plants such as bottlebrush squirreltail, plains pricklypear, annuals, and weedlike forbs may invade. The potential plant community will produce about 900 pounds of air-dry vegetation per acre in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

The Elloam soil produces less vegetation than the Phillips soil. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—The Phillips soil is suited to windbreaks. Suitable trees for planting are Russian-olive and Siberian elm. Suitable shrubs are Siberian peashrub, American plum, silver buffaloberry, and lilac. The Elloam soil is poorly suited to windbreaks because of the content of sodium and salts.

Homesite development.—If this unit is used for homesite development, it is limited mainly by the very slow permeability, low soil strength, and shrink-swell potential. If the unit is used for septic tank absorption fields, the limitation of very slow permeability can be overcome by increasing the size of the absorption field. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IVs, nonirrigated. The Phillips soil is in Clayey range site, 10- to 14-inch precipitation zone, and the Elloam soil is in Dense Clay range site, 10- to 14-inch precipitation zone.

45—Riverwash. Riverwash consists of nearly level, unstabilized alluvium on flood plains, mainly along the Missouri and Poplar Rivers. It consists mainly of sand, pebbles, and cobbles. It is flooded, washed, and reworked so frequently that it supports little, if any, vegetation. Riverwash typically is light gray or very pale brown.

Included in this unit are small areas of Banks and Trembles soils.

Runoff is rapid, and the hazard of water erosion is high.

Riverwash is used for ground water recharge, as a source of sand and gravel, and for wildlife habitat.

This map unit is in capability subclass VIIIe.

46—Savage clay loam, 2 to 8 percent slopes. This deep, well drained soil is on fans and terraces on uplands. It is throughout the survey area except in the southwestern part of Roosevelt County. It formed in alluvium. Slope is 2 to 8 percent. Slopes are mainly 250 to 1,000 feet long. Elevation is 2,000 to 3,000 feet.

Included in this unit are small areas of Williams, Farnuf, and Grail soils and Savage clay loam that has slopes of less than 2 percent. These areas do not adversely affect the use and management of this unit for nonirrigated cultivated crops. Also included are small areas of Nishon and Adger soils. The Nishon soils are in small, enclosed basins that are subject to ponding. The ponding interferes with seeding. The Adger soil is strongly sodium- and salt-affected and has low potential for producing crops.

Typically, the Savage soil has a surface layer of grayish brown clay loam 6 inches thick. The upper 9 inches of the subsoil is grayish brown clay, and the lower 9 inches is light brownish gray silty clay. The substratum to a depth of 60 inches or more is light brownish gray silty clay.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used mainly for nonirrigated cultivated crops and as rangeland. The main nonirrigated crops are spring wheat, winter wheat, and barley.

Crop management.—If this soil is used for nonirrigated cultivated crops, it is limited by the hazards of water erosion and soil blowing. Minimum tillage, contour cultivation, grassed waterways, tall grass barriers, and stripcropping reduce soil blowing and water erosion. Return of crop residue to the soil helps to maintain good tilth and a desirable water intake rate.

Range management.—The potential plant community on the Savage soil is mainly western wheatgrass, winterfat, green needlegrass, and plains muhly. If the range is excessively grazed, these plants decrease and plains reedgrass, Sandberg bluegrass, silver sagebrush, and blue grama increase. If excessive grazing continues, plants such as broom snakeweed, plains pricklypear, clubmoss, sweetclover, weedlike forbs, and annuals may invade. The potential plant community will produce about 1,500 pounds of air-dry vegetation per acre in years of above-normal precipitation and 900 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, Rocky Mountain juniper, and ponderosa pine. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, and common chokecherry.

Homesite development.—If this soil is used for homesite development, it is limited mainly by the slow permeability, shrink-swell potential, and low soil strength. If the soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Clayey range site, 10- to 14-inch precipitation zone.

47—Tally sandy loam, 2 to 8 percent slopes. This is a deep, well drained, droughty soil on terraces and foot slopes on uplands throughout the survey area except the southwestern part of Roosevelt County. It formed in alluvial and eolian deposits. Slope is 2 to 8 percent. Slopes are mainly 100 to 500 feet long. Elevation is 2,000 to 3,000 feet.

Included in the mapped areas are small areas of Martinsdale soils, Parshall sandy loam, and Dooley soils. These soils do not adversely affect the use and management of this unit for nonirrigated cultivated crops. Also included are small areas of Lihen and Turner soils. The Lihen and Turner soils are more droughty than this Tally soil. Addition of barnyard manure helps to overcome this limitation.

Typically, the Tally soil has a surface layer of dark brown sandy loam 6 inches thick. The upper 8 inches of the subsoil is dark brown sandy loam, and the lower 18 inches is brown sandy loam. The upper 6 inches of the substratum is brown sandy loam, and the lower part to a depth of 60 inches or more is light yellowish brown sandy loam.

Permeability is moderately rapid, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This soil is used mainly for nonirrigated cultivated crops and as rangeland. The main nonirrigated crops are spring wheat and barley.

Crop management.—If this soil is used for nonirrigated cultivated crops, it is limited by the hazard of soil blowing and by droughtiness. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. Annual cropping is feasible. The effectiveness of summer fallow for storing moisture is limited because of the moderate available water capacity. Additions of barnyard manure improve the available water capacity.

Range management.—The potential plant community is mainly thickspike wheatgrass, needleandthread, prairie sandreed, and Indian ricegrass. If the range is excessively grazed, thickspike wheatgrass, prairie sandreed, and Indian ricegrass decrease and needleandthread, blue grama, threadleaf sedge, and fringed sagewort increase. If excessive grazing continues, plants such as cheatgrass, Japanese brome, broom snakeweed, plains pricklypear, and weedlike forbs may invade. The potential plant community will produce about 1,800 pounds of air-dry vegetation per acre in years of above-normal precipitation and 900 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, Rocky Mountain juniper, ponderosa pine, green ash, and blue spruce. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and lilac. The risk of soil blowing can be reduced by cultivating only between the rows of windbreaks.

Homesite development.—If this soil is used for homesite development, it is limited mainly by frost action and susceptibility to slumping. Cutbanks are not stable and are subject to slumping. Frost action can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome this limitation.

This map unit is in capability subclass IVe, nonirrigated. It is in Sandy range site, 10- to 14-inch precipitation zone.

48—Tally sandy loam, 8 to 15 percent slopes. This deep, well drained, droughty soil is on terraces and foot slopes on uplands. It is throughout the survey area

except in the southwestern part of Roosevelt County. It formed in eolian deposits. Slope is 8 to 15 percent. Slopes are mainly 100 to 300 feet long. Elevation is 2,000 to 3,100 feet.

Included in this unit are small areas of Tally soils that have slopes less than 8 percent. These areas do not adversely affect the use and management of this unit for nonirrigated cultivated crops. Also included are small areas of Lihen, Turner, and Blanchard soils. These soils are more droughty than this Tally soil. Addition of barnyard manure helps to overcome this limitation.

Typically, the Tally soil has a surface layer of dark brown sandy loam 6 inches thick. The upper 8 inches of the subsoil is dark brown sandy loam, and the lower 18 inches is brown sandy loam. The upper 6 inches of the substratum is brown sandy loam, and the lower part to a depth of 60 inches or more is light yellowish brown sandy loam.

Permeability is moderately rapid, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 45 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This soil is used mainly for nonirrigated cultivated crops, for grass hay, and as rangeland. The main nonirrigated crop is spring wheat.

Crop management.—This soil is poorly suited to nonirrigated cultivated crops. It is limited mainly by the hazards of soil blowing and water erosion and by droughtiness. Annual cropping is feasible. The effectiveness of summer fallow for storing moisture is limited because of the moderate available water capacity. Additions of barnyard manure improve the available water capacity. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. The amount of moisture in the soil can be increased by using tall grass barriers to minimize evaporation and trap snow. Return of crop residue helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces water erosion.

Range management.—The potential plant community is mainly thickspike wheatgrass, needleandthread, prairie sandreed, and Indian ricegrass. If the range is excessively grazed, thickspike wheatgrass, prairie sandreed, and Indian ricegrass decrease and needleandthread, blue grama, threadleaf sedge, and fringed sagewort increase. If excessive grazing continues, plants such as cheatgrass, Japanese brome, broom snakeweed, plains pricklypear, and weedlike forbs may invade. The potential plant community will produce about 1,700 pounds of air-dry vegetation per acre in years of above-normal precipitation and 800 pounds in years of below-normal precipitation. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, Rocky Mountain juniper, ponderosa pine, green ash, and blue spruce. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and lilac. The risk of soil blowing can be reduced by cultivating only between the rows of windbreaks.

Homesite development.—If this soil is used for homesite development, it is limited mainly by slope. The steepness of slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Effluent from absorption fields can surface in downslope areas and create a hazard to health.

This map unit is in capability subclass IVe, nonirrigated. It is in Sandy range site, 10- to 14-inch precipitation zone.

49—Tally-Lihen sandy loams, 1 to 8 percent slopes. This map unit is on uplands. It is throughout the survey area except in the southwestern part of Roosevelt County. Slope is 1 to 8 percent. Slopes are mainly 50 to 500 feet long. Elevation is 2,500 to 3,100 feet.

This unit is about 60 percent Tally sandy loam and 30 percent Lihen sandy loam.

Included in this unit are small areas of Turner and Parshall sandy loams and Tally soils that are silty clay loam below a depth of about 36 inches. These Tally soils are in the southwestern part of Daniels County. These included areas do not adversely affect the use and management of this unit for nonirrigated cultivated crops. Also included are small areas of Wabek and Blanchard soils. These soils are droughty. Addition of barnyard manure helps to overcome this limitation. Included areas make up about 10 percent of the total acreage.

The Tally soil is deep, well drained, and droughty. It formed in alluvial and eolian deposits on terraces. Typically, the Tally soil has a surface layer of dark brown sandy loam 6 inches thick. The upper 8 inches of the subsoil is dark brown sandy loam, and the lower 18 inches is brown sandy loam. The upper 6 inches of the substratum is brown sandy loam, and the lower part to a depth of 60 inches or more is light yellowish brown sandy loam.

Permeability is moderately rapid, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The Lihen soil is deep, somewhat excessively drained, and droughty. It formed in alluvial and eolian deposits on terraces. Typically, the Lihen soil has a surface layer of dark grayish brown and grayish brown sandy loam 9 inches thick. The upper 27 inches of the underlying

material is grayish brown loamy sand, and the lower part to a depth of 60 inches or more is light brownish gray sand.

Permeability is rapid, and available water capacity is low. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is calcareous below a depth of about 10 to 24 inches.

This unit is used mainly for nonirrigated cultivated crops and as rangeland. The main nonirrigated crops are spring wheat and barley.

Crop management.—This unit is poorly suited to nonirrigated cultivated crops. It is limited mainly by droughtiness and the hazard of soil blowing. Annual cropping is feasible. The effectiveness of summer fallow for storing moisture is limited because of the restricted available water capacity. Additions of barnyard manure improve the available water capacity. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. Crops respond to phosphate and nitrogen fertilizer.

Range management.—The potential plant community on this unit is mainly thickspike wheatgrass, needleandthread, prairie sandreed, and Indian ricegrass. If the range is excessively grazed, thickspike wheatgrass, prairie sandreed, and Indian ricegrass decrease and needleandthread, blue grama, threadleaf sedge, and fringed sagewort increase. If excessive grazing continues, plants such as cheatgrass, Japanese brome, broom snakeweed, plains pricklypear, and weedlike forbs may invade.

The potential plant community on the Tally soil produces about 1,800 pounds of air-dry vegetation per acre in years of above-normal precipitation and 900 pounds in years of below-normal precipitation.

The potential plant community on the Lihen soil produces about 1,600 pounds of air-dry vegetation per acre in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice on this unit.

Windbreak management.—This unit is suited to windbreaks. Suitable trees for planting on the Tally soil are Russian-olive, Siberian elm, Rocky Mountain juniper, ponderosa pine, green ash, and blue spruce. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and lilac. Suitable trees for planting on the Lihen soil are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub and silver buffaloberry. The risk of soil blowing can be reduced by cultivating only between the rows of windbreaks.

Homesite development.—If this unit is used for homesite development, it is limited mainly by the frost action of the Tally soil, rapid permeability of the Lihen soil, and susceptibility to slumping. Cutbanks are not stable and are subject to slumping. Because the Lihen soil is rapidly permeable, effluent from septic tank absorption fields may contaminate ground water. Frost action of the Tally soil can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome this limitation.

This map unit is in capability subclass IVe, nonirrigated. It is in Sandy range site, 10- to 14-inch precipitation zone.

50—Telstad loam, 2 to 8 percent slopes. This deep, well drained soil is on uplands. It is in the southwestern part of Roosevelt County. It formed in glacial till. Slope is 2 to 8 percent. Slopes are mainly 200 to 1,000 feet long. Elevation is 2,000 to 2,500 feet.

Included in this unit are small areas of Evanston and Phillips soils and Telstad soils that have slopes of less than 2 percent. These areas do not adversely affect the use and management of this unit for nonirrigated cultivated crops. Also included are small areas of Elloam and Hillon soils. The subsoil of the Elloam soils is strongly sodium-affected and moderately salt-affected; therefore, these soils produce much lower yields of crops than does this Telstad soil. Yields can be increased by applying gypsum and by plowing to a depth of about 2 to 3 feet. The areas of Hillon soils also produce lower yields of crops. Yields can be increased by addition of barnyard manure and phosphate fertilizer.

Typically, the Telstad soil, where mixed to a depth of 7 inches, has a surface layer of grayish brown loam. The subsoil is grayish brown clay loam 17 inches thick. The substratum to a depth of 60 inches or more is light brownish gray clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used mainly for nonirrigated cultivated crops and as rangeland. The main nonirrigated crops are spring wheat, winter wheat, and barley.

Crop management.—If this soil is used for nonirrigated cultivated crops, it is limited by the hazards of water erosion and soil blowing. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. The amount of moisture in the soil can be increased by using tall grass barriers to minimize evaporation and trap snow. Return of crop residue helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces water erosion. Some areas of this soil have glacial stones and boulders on the surface. In most cultivated areas, these stones and boulders have been

removed to facilitate cultivation and have been piled along field borders.

Range management.—The potential plant community is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, and winterfat. If the range is excessively grazed, these plants decrease and needleandthread, little porcupinegrass, blue grama, junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as cheatgrass, sixweeks fescue, clubmoss, and weedlike forbs may invade. The potential plant community will produce about 1,600 pounds of air-dry vegetation per acre in years of above-normal precipitation and 900 pounds in years of below-normal precipitation. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Siberian elm, green ash, Rocky Mountain juniper, ponderosa pine, and blue spruce. Suitable shrubs are Siberian peashrub, American plum, Tatarian honeysuckle, and common chokecherry.

Homesite development.—If this soil is used for homesite development, it is limited mainly by the slow permeability, shrink-swell potential, frost action, and low soil strength. If the soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. Shrinking and swelling, frost action, and low soil strength can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

51—Telstad-Hillon loams, 2 to 8 percent slopes. This map unit is on uplands in the southwestern part of Roosevelt County. Slope is 2 to 8 percent. Slopes are mainly 100 to 500 feet long. Elevation is 2,000 to 2,500 feet.

This unit is about 60 percent Telstad loam and 30 percent Hillon loam. The Telstad soils are in the less sloping areas of this unit, and the Hillon soils are in the steeper areas.

Included in this unit are small areas of Phillips, Elloam, and Evanston soils and Telstad and Hillon soils that have slopes of more than 8 percent. Included areas make up about 10 percent of the total acreage. The Phillips and Evanston soils do not adversely affect the use and management of this unit for nonirrigated cultivated crops. The Elloam soils are strongly sodium-affected and moderately salt-affected in the subsoil; therefore, they produce much lower yields of crops. Yields can be increased by applying gypsum and by plowing to a depth of about 2 to 3 feet. The areas of Telstad and Hillon soils that have slopes of more than 8 percent are more susceptible to water erosion and therefore should be cultivated on the contour.

The Telstad soil is deep and well drained. It formed in glacial till. Typically, the Telstad soil, where mixed to a depth of 7 inches, has a surface layer of grayish brown loam. The subsoil is grayish brown clay loam 17 inches thick. The substratum to a depth of 60 inches or more is light brownish gray clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Hillon soil is deep and well drained. It formed in glacial till. Typically, the surface layer is light brownish gray loam 8 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 28 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. This soil is calcareous throughout.

This unit is used mainly for nonirrigated cultivated crops and as rangeland. The main nonirrigated crops are spring wheat, winter wheat, and barley.

Crop management.—If this unit is used for nonirrigated cultivated crops, it is limited by the hazards of water erosion and soil blowing. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. The amount of moisture in the soil can be increased by using tall grass barriers to minimize evaporation and trap snow. Return of crop residue helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces water erosion. The Hillon soil is less fertile; therefore, it normally produces lower yields than does the Telstad soil. Yields can be improved by addition of barnyard manure and phosphate fertilizer. Some areas of this unit have glacial stones and boulders on the surface. In most cultivated areas, these stones and boulders have been removed to facilitate cultivation and have been piled along field borders.

Range management.—The potential plant community on this unit is mainly bluebunch wheatgrass, western wheatgrass, green needlegrass, and winterfat. If the range is excessively grazed, these plants decrease and needleandthread, little porcupinegrass, blue grama, junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as cheatgrass, sixweeks fescue, clubmoss, and weedlike forbs may invade.

The potential plant community on the Telstad soil produces about 1,600 pounds of air-dry vegetation per acre in years of above-normal precipitation and 900 pounds in years of below-normal precipitation.

The potential plant community on the Hillon soil produces about 1,400 pounds of air-dry vegetation per acre in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice on this unit.

Windbreak management.—This unit is suited to windbreaks. Suitable trees for planting are Siberian elm, green ash, Rocky Mountain juniper, ponderosa pine, and blue spruce. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and common chokecherry. The risk of soil blowing can be reduced by cultivating only between the rows of windbreaks.

Homesite development.—If this unit is used for homesite development, it is limited mainly by the slow permeability, shrink-swell potential, frost action, and low soil strength. If the unit is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. Shrinking and swelling, frost action, and low soil strength can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

52—Thebo-Lisam complex, 15 to 45 percent slopes. This map unit is on foot slopes and uplands in the southwestern and south-central parts of Roosevelt County. Slope is 15 to 45 percent. Slopes are mainly 100 to 300 feet long. Elevation is 2,000 to 2,500 feet.

This unit is about 55 percent Thebo clay and 30 percent Lisam silty clay. The Thebo soil is in the less sloping areas of this unit, and the Lisam soil is in the steeper areas.

Included in this unit are small areas of Zahill, Hillon, and Vanda Variant soils and shale outcroppings. Also included are small areas of soils that are similar to the Thebo and Lisam soils but are slightly acid or medium acid in the underlying material. Included areas make up about 15 percent of the total acreage. The areas of included soils do not adversely affect the use and management of this unit as rangeland. The Zahill and Hillon soils formed in glacial till, which commonly caps areas of this unit. The areas of shale outcroppings have limited value for the production of forage.

The Thebo soil is moderately deep, well drained, and droughty. It formed in material derived from consolidated shale and is on foot slopes of uplands. Typically, the Thebo soil has a surface layer of grayish brown clay 2 inches thick. The underlying material to a depth of 32 inches is grayish brown clay. Below this to a depth of 60 inches or more is gray consolidated shale. Consolidated shale is at a depth of 20 to 40 inches.

Permeability is very slow, and available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is about 21 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Lisam soil is shallow, well drained, and very droughty. It formed in material derived from consolidated shale and is on uplands. Typically, the Lisam soil has a surface layer of light brownish gray silty clay 4 inches thick. The underlying material to a depth of 17 inches is light brownish gray silty clay. Below this to a depth of 60 inches or more is consolidated shale. Consolidated shale is at a depth of 10 to 20 inches.

Permeability is very slow, and available water capacity is very low. Effective rooting depth is 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is about 17 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This unit is used mainly as rangeland.

Crop management.—This unit is poorly suited to cultivated crops. It is limited mainly by slope and droughtiness.

Range management.—The potential plant community on the Thebo soil is mainly western wheatgrass, plains muhly, winterfat, and green needlegrass. If the range is excessively grazed, these plants decrease and plains reedgrass, Sandberg bluegrass, blue grama, and silver sagebrush increase. If excessive grazing continues, plants such as broom snakeweed, plains pricklypear, clubmoss, sweetclover, and weedlike forbs may invade. The potential plant community will produce about 900 pounds of air-dry vegetation per acre in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

The potential plant community on the Lisam soil is mainly western wheatgrass, green needlegrass, Montana wheatgrass, and plains reedgrass. If the range is excessively grazed, western wheatgrass, green needlegrass, and Montana wheatgrass decrease and plains reedgrass, blue grama, Sandberg bluegrass, fringed sagewort, and rubber rabbitbrush increase. If excessive grazing continues, plants such as broom snakeweed, cheatgrass, Japanese brome, sweetclover, and weedlike forbs may invade. The potential plant community will produce about 700 pounds of air-dry vegetation per acre in years of above-normal precipitation and 300 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas. Trails or

walkways can be constructed to encourage livestock grazing in areas where access is limited. Mechanical treatment practices are not practical.

Windbreak management.—This unit is poorly suited to windbreaks mainly because of slope.

Homesite development.—If this unit is used for homesite development, it is limited mainly by slope. The soil in the unit is subject to slippage. The deep cuts needed to provide essentially level building sites can expose consolidated shale. Onsite inspection is advisable.

This map unit is in capability subclass VIIe, nonirrigated. The Thebo soil is in Clayey range site, 10- to 14-inch precipitation zone, and the Lisam soil is in Shallow to Clay range site, 10- to 14-inch precipitation zone.

53—Tinsley very gravelly sandy loam, 15 to 45 percent slopes. This deep, excessively drained, very droughty soil is on knolls and ridges on uplands and on the edge of terraces throughout the survey area. It formed in outwash. Slope is 15 to 45 percent. Slopes are mainly 50 to 150 feet long. Elevation is 2,000 to 3,000 feet.

Included in this unit are small areas of Zahill, Hillon, Wabek, Cabba, Turner, and Beaverton soils. Also included are small areas of Tinsley soils that have a loam, gravelly loam, or gravelly sandy loam surface layer. These areas do not adversely affect the use and management of this unit as rangeland.

Typically, the Tinsley soil has a surface layer of brown very gravelly sandy loam 3 inches thick. The underlying material to a depth of 60 inches or more is pale brown very gravelly sand.

Permeability is rapid, and available water capacity is very low. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is 60 inches or more. Runoff is slow to medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

Most areas of this soil are used as rangeland. A few areas are used as a source of sand and gravel.

Crop management.—This soil is poorly suited to cultivated crops. It is limited mainly by slope, droughtiness, and poor soil tilth.

Range management.—The potential plant community is mainly bluebunch wheatgrass, needleandthread, western wheatgrass, and plains muhly. If the range is excessively grazed, bluebunch wheatgrass, western wheatgrass, and plains muhly decrease and needleandthread, blue grama, perennial forbs, and fringed sagewort increase. If excessive grazing continues, plants such as broom snakeweed, clubmoss, and weedlike forbs may invade. The potential plant community will produce about 750 pounds of air-dry vegetation per acre in years of above-normal precipitation and 350 pounds in years of below-normal precipitation. Mechanical treatment practices are not practical.

Windbreak management.—This soil is poorly suited to windbreaks because of steepness of slope and the very low available water capacity.

Homesite development.—If this soil is used for homesite development, it is limited mainly by steepness of slope.

This map unit is in capability subclass VIIe, nonirrigated. It is in Gravel range site, 10- to 14-inch precipitation zone.

54—Trembles fine sandy loam, 0 to 2 percent slopes. This deep, well drained, droughty soil is on flood plains. It is throughout the survey area except in the southwestern part of Roosevelt County. The soil formed in alluvium and is subject to flooding. Slope is 0 to 2 percent. Slopes are mainly 25 to 200 feet long. Elevation is 2,000 to 2,500 feet.

Included in this unit are small areas of Havrelon soils and Trembles soils that have a sandy loam or loam surface layer. These areas do not adversely affect the use and management of this unit as rangeland. Also included are small areas of Banks soils. The Banks soils are subject to frequent periods of flooding and are somewhat excessively drained. Addition of crop residue such as wheat or barley straw increases the available water capacity.

Typically, the Trembles soil has a surface layer of light brownish gray fine sandy loam 8 inches thick. The upper 23 inches of the underlying material is brown sandy loam and a few thin strata of loam, the next 17 inches is pale brown sandy loam and a few thin strata of loam and loamy sand, and the lower part to a depth of 60 inches or more is pale brown loamy sand.

Permeability is moderately rapid, and available water capacity is moderate to high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 50 inches. Runoff is very slow to slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is subject to flooding during prolonged, high intensity storms. Channeling and deposition are common along streambanks. The soil is subject to occasional periods of flooding from April through June.

This soil is used mainly as rangeland. It is also used for nonirrigated cultivated crops. The main nonirrigated crops are spring wheat, winter wheat, and barley.

Crop management.—If this soil is used for nonirrigated cultivated crops, it is limited by the hazard of flooding in spring, the hazard of soil blowing, and droughtiness. Flooding may delay planting. Soil blowing can be reduced by using all crop residue and practicing minimum tillage. Addition of crop residue such as wheat or barley straw increases the available water capacity.

Range management.—The potential plant community is mainly prairie sandreed, green needlegrass, western

wheatgrass, and winterfat. If the range is excessively grazed, these plants decrease and needleandthread, fringed sagewort, and silver sagebrush increase. If excessive grazing continues, plants such as Kentucky bluegrass, Canada bluegrass, and weedlike forbs may invade. The potential plant community will produce about 2,500 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,500 pounds in years of below-normal precipitation. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, Rocky Mountain juniper, cottonwood, and blue spruce. Suitable shrubs are Siberian peashrub, American plum, Tatarian honeysuckle, Nanking cherry, and lilac. The risk of soil blowing can be reduced by cultivating only between the rows of windbreaks.

Homesite development.—If this soil is used for homesite development, it is limited mainly by the hazard of flooding in spring.

This map unit is in capability subclass IVw, nonirrigated. It is in Overflow range site, 10- to 14-inch precipitation zone.

55—Trembles fine sandy loam, protected, 0 to 2 percent slopes. This deep, well drained, droughty soil is on flood plains. It is throughout the survey area except in the southwestern part of Roosevelt County. It formed in alluvium. Slope is 0 to 2 percent. Slopes are mainly 50 to 250 feet long. Elevation is 1,875 to 2,000 feet.

Included in this unit are small areas of protected Havrelon and Trembles soils that have a sandy loam or loam surface layer. These areas do not adversely affect the use and management of this unit as cropland. Also included are small areas of Banks soils. The Banks soils commonly are adjacent to the Missouri River. They are somewhat excessively drained. Addition of crop residue such as wheat or barley straw increases the available water capacity.

Typically, the Trembles soil has a surface layer of light brownish gray fine sandy loam 8 inches thick. The upper 23 inches of the underlying material is brown sandy loam and a few thin strata of loam, the next 17 inches is pale brown sandy loam and a few thin strata of loam and loamy sand, and the lower part to a depth of 60 inches or more is pale brown loamy sand.

Permeability is moderately rapid, and available water capacity is moderate to high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 50 inches. Runoff is very slow to slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This soil is used mainly for nonirrigated cultivated crops and as rangeland. It is also used for irrigated cultivated crops and as woodland. The main nonirrigated crops are spring wheat, winter wheat, barley, and alfalfa hay. The main irrigated crops are alfalfa hay and corn for silage.

Crop management.—If this soil is used for nonirrigated cultivated crops, it is limited by the hazard of soil blowing and by droughtiness. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. Additions of barnyard manure improve the available water capacity. If this soil is used for irrigated cultivated crops, it is limited by the moderately rapid permeability. Sprinkler irrigation is a suitable method. When irrigated, this soil produces about 20 tons of corn for silage per acre under a high level of management. Crops respond to phosphate and nitrogen fertilizer.

Range management.—Where this soil is grassland, the potential plant community is mainly prairie sandreed, needleandthread, thickspike wheatgrass, and Indian ricegrass. If the range is excessively grazed, prairie sandreed, thickspike wheatgrass, and Indian ricegrass decrease and needleandthread, blue grama, threadleaf sedge, and fringed sagewort increase. If excessive grazing continues, plants such as cheatgrass, Japanese brome, broom snakeweed, plains pricklypear, and weedlike forbs may invade. The potential plant community will produce about 1,900 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Where this soil is forested, the potential native understory beneath a fully stocked stand of plains cottonwood is prairie sandreed, Canada wildrye, slender wheatgrass, common chokecherry, snowberry, Woods rose, field horsetail, green ash, Rocky Mountain juniper, poison-ivy, American licorice, and western meadowrue. Yield decreases and the composition of the understory changes as the overstory tree canopy increases.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, Rocky Mountain juniper, blue spruce, and cottonwood. Suitable shrubs are Siberian peashrub, American plum, Tatarian honeysuckle, Nanking cherry, and lilac. The risk of soil blowing can be reduced by cultivating only between the rows of windbreaks.

Forest management.—This soil is suited to plains cottonwood. The site index for plains cottonwood is 65. The potential annual production per acre is about 30 cubic feet or 160 board feet (Scribner rule). Potential production is for an even-aged, fully stocked stand of trees.

The main limitations for timber management are the difficulty of reestablishing plains cottonwood and soil compaction. The understory vegetation competes vigorously with tree seedlings for the limited amount of available water. Reduction of competing vegetation encourages adequate natural regeneration and the survival of planted seedlings. Shelterwood and selection

silvicultural harvesting systems improve regeneration. Compaction of the soil can occur if vehicles are used when the soil is wet. This limitation can be overcome by using vehicles only when the soil is dry or is covered with snow or by using cable yarding systems when the soil is susceptible to compaction.

Homesite development.—If this soil is used for homesite development, it is limited mainly by frost action. Frost action can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome this limitation.

This map unit is in capability subclass IVe, nonirrigated and irrigated. It is in Sandy range site, 10- to 14-inch precipitation zone.

56—Turner sandy loam, 0 to 2 percent slopes. This deep, well drained, droughty soil is on fans and terraces on uplands. It is throughout the survey area except in the southwestern part of Roosevelt County. It formed in outwash. Slope is 0 to 2 percent. Slopes are mainly 1,000 to 2,000 feet long. Elevation is 2,000 to 3,000 feet.

Included in this unit are small areas of Turner soils that have a loam surface layer and Farnuf, Wabek, Martinsdale, Tally, Lihen, and Beaverton soils. Also included are small areas of Turner soils that have slopes of more than 2 percent. The Wabek, Lihen, and Beaverton soils are more droughty than the Turner soils. Addition of barnyard manure helps to overcome this limitation. The Turner soils that have slopes of more than 2 percent are more susceptible to water erosion. Farming on the contour or across the slope reduces water erosion. The other included soils do not adversely affect the use and management of this unit for nonirrigated cultivated crops.

Typically, the Turner soil has a surface layer of dark brown sandy loam 10 inches thick. The upper 11 inches of the subsoil is brown sandy clay loam, and the lower 3 inches is light olive brown loamy sand. The upper 6 inches of the substratum is grayish brown sand, and the lower part to a depth of 60 inches or more is grayish brown very gravelly sand.

Permeability is moderate to a depth of 21 inches and rapid below this depth. Available water capacity is low to moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 50 inches. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This soil is used mainly for nonirrigated cultivated crops and as rangeland. The main nonirrigated crops are spring wheat, barley, alfalfa hay, and grass-legume hay.

Crop management.—If this soil is used for nonirrigated cultivated crops, it is limited by the hazard of soil blowing and by droughtiness. Annual cropping is feasible. The effectiveness of summer fallow for storing moisture is limited because of the low to moderate available water capacity. Additions of barnyard manure improve the available water capacity. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. Crops respond to phosphate and nitrogen fertilizer.

Range management.—The potential plant community is mainly needleandthread, prairie sandreed, thickspike wheatgrass, and Indian ricegrass. If the range is excessively grazed, prairie sandreed, thickspike wheatgrass, and Indian ricegrass decrease and needleandthread, blue grama, threadleaf sedge, and fringed sagewort increase. If excessive grazing continues, plants such as cheatgrass, Japanese brome, broom snakeweed, plains pricklypear, and weedlike forbs may invade. The potential plant community will produce about 1,550 pounds of air-dry vegetation per acre in years of above-normal precipitation and 850 pounds in years of below-normal precipitation. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Siberian elm, Russian-olive, Rocky Mountain juniper, green ash, and ponderosa pine. Suitable shrubs are Siberian peashrub, Nanking cherry, silver buffaloberry, lilac, Tatarian honeysuckle, and common chokecherry. The risk of soil blowing can be reduced by cultivating only between the rows of windbreaks.

Homesite development.—If this soil is used for homesite development, it is limited mainly by shrink-swell potential, frost action, and susceptibility of cutbanks to caving in. In the construction of basements or foundations for dwellings, the limitation of shrinking and swelling can be overcome by backfilling with suitable material that has low shrink-swell potential. Frost action can adversely affect the quality of roadbeds and road surfaces. If used as a base for roads and streets, the upper part of the soil can be mixed with the underlying material to increase its strength and stability. Cutbanks are not stable and are subject to slumping. Because the soil is rapidly permeable below a depth of 21 inches, effluent from septic tank absorption fields may contaminate ground water.

This map unit is in capability subclass IVe, nonirrigated. It is in Sandy range site, 10- to 14-inch precipitation zone.

57—Turner sandy loam, 2 to 8 percent slopes. This deep, well drained, droughty soil is on fans and terraces on uplands. It is throughout the survey area except in the southwestern part of Roosevelt County. It formed in outwash. Slope is 2 to 8 percent. Slopes are mainly 250 to 1,000 feet long. Elevation is 2,000 to 3,100 feet.

Included in this unit are small areas of Turner soils that have a loam surface layer and Farnuf, Wabek, Martinsdale, Tally, Lihen, and Beaverton soils. Also included are small areas of Turner soils that have a high

content of lime in the substratum or have slopes of less than 2 percent. The Wabek, Lihen, and Beaverton soils are more droughty than this Turner soil. Addition of barnyard manure helps to overcome this limitation. The other included soils do not adversely affect the use and management of this unit for nonirrigated cultivated crops.

Typically, the Turner soil has a surface layer of dark brown sandy loam 10 inches thick. The upper 11 inches of the subsoil is yellowish brown sandy clay loam, and the lower 3 inches is light olive brown loamy sand. The upper 6 inches of the substratum is grayish brown sand, and the lower part to a depth of 60 inches or more is grayish brown very gravelly sand.

Permeability is moderate to a depth of 21 inches and rapid below this depth. Available water capacity is low to moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 50 inches. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This soil is used mainly for nonirrigated cultivated crops and as rangeland. The main nonirrigated crops are spring wheat, barley, alfalfa hay, and grass-legume hay.

Crop management.—If this soil is used for nonirrigated cultivated crops, it is limited by the hazard of soil blowing and droughtiness. Annual cropping is feasible. The effectiveness of summer fallow for storing moisture is limited because of the low to moderate available water capacity. Additions of barnyard manure improve the available water capacity. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing and water erosion. Crops respond to phosphate and nitrogen fertilizer.

Range management.—The potential plant community is mainly needleandthread, prairie sandreed, thickspike wheatgrass, and Indian ricegrass. If the range is excessively grazed, prairie sandreed, thickspike wheatgrass, and Indian ricegrass decrease and needleandthread, blue grama, threadleaf sedge, and fringed sagewort increase. If excessive grazing continues, plants such as cheatgrass, Japanese brome, broom snakeweed, plains pricklypear, and weedlike forbs may invade. The potential plant community will produce about 1,500 pounds of air-dry vegetation per acre in years of above-normal precipitation and 800 pounds in years of below-normal precipitation. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Siberian elm, Russian-olive, Rocky Mountain juniper, green ash, and ponderosa pine. Suitable shrubs are Siberian peashrub, Nanking cherry, silver buffaloberry, lilac, Tatarian honeysuckle, and common chokecherry. The risk of soil blowing can be reduced by cultivating only between the rows of windbreaks.

Homesite development.—If this soil is used for homesite development, it is limited mainly by shrink-swell potential, frost action, and susceptibility of cutbanks to caving in. In the construction of basements or foundations for dwellings, the limitation of shrinking and swelling can be overcome by backfilling with suitable material that has low shrink-swell potential. Frost action can adversely affect the quality of roadbeds and road surfaces. If used as a base for roads and streets, the upper part of the soil can be mixed with the underlying material to increase its strength and stability. Cutbanks are not stable and are subject to slumping. Because the soil is rapidly permeable below a depth of 21 inches, effluent from septic tank absorption fields may contaminate ground water.

This map unit is in capability subclass IVe, nonirrigated. It is in Sandy range site, 10- to 14-inch precipitation zone.

58—Turner-Beaverton complex, 2 to 8 percent slopes. This map unit is on uplands. It is throughout the survey area except in the southwestern part of Roosevelt County. Slope is 2 to 8 percent. Slopes are mainly 100 to 300 feet long. Elevation is 2,400 to 3,100 feet.

This unit is about 60 percent Turner sandy loam and 30 percent Beaverton very cobbly sandy loam. The Turner soil is in the less sloping areas of this unit, and the Beaverton soil is in the steeper areas.

Included in this unit are small areas of Martinsdale, Farnuf, and Tally soils and Beaverton and Turner soils that have a loam surface layer or have slopes of less than 2 percent. These areas do not adversely affect the use and management of this unit for nonirrigated cultivated crops. Also included are small areas of Wabek and Tinsley soils. The Wabek and Tinsley soils are more droughty than the Turner and Beaverton soils. Addition of barnyard manure helps to overcome this limitation. Included areas make up about 10 percent of the total acreage.

The Turner soil is deep, well drained, and droughty. It formed in outwash. Typically, the Turner soil has a surface layer of dark brown sandy loam 10 inches thick. The upper 11 inches of the subsoil is yellowish brown sandy clay loam, and the lower 3 inches is light olive brown loamy sand. The upper 6 inches of the substratum is grayish brown sand, and the lower part to a depth of 60 inches or more is grayish brown very gravelly sand.

Permeability is moderate to a depth of 21 inches and rapid below this depth. Available water capacity is low to moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 50 inches. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The Beaverton soil is deep, well drained, and droughty. It formed in outwash. Typically, the Beaverton

soil has a surface layer of brown very cobbly sandy loam 4 inches thick. The subsoil is brown and yellowish brown very cobbly sandy clay loam 20 inches thick. The substratum to a depth of 60 inches or more is brown very cobbly loamy sand.

Permeability is moderate to a depth of 24 inches and rapid to very rapid below this depth. Available water capacity is very low to low. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 50 inches. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This unit is used mainly for nonirrigated cultivated crops and as rangeland. The main nonirrigated crops are spring wheat and barley.

Crop management.—If this unit is used for nonirrigated cultivated crops, it is limited by the hazard of soil blowing and by droughtiness. Also, the large amount of cobbles in the Beaverton soil may interfere with tillage. Annual cropping is feasible on this unit. The effectiveness of summer fallow for storing moisture is limited because of the restricted available water capacity. Additions of barnyard manure improve the available water capacity. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing and water erosion. Crops respond to phosphate and nitrogen fertilizer.

Range management.—The potential plant community on the Turner soil is mainly needleandthread, thickspike wheatgrass, prairie sandreed, and Indian ricegrass. If the range is excessively grazed, prairie sandreed, thickspike wheatgrass, and Indian ricegrass decrease and needleandthread, blue grama, threadleaf sedge, and fringed sagewort increase. If excessive grazing continues, plants such as cheatgrass, Japanese brome, broom snakeweed, plains pricklypear, and weedlike forbs may invade. The potential plant community will produce about 1,500 pounds of air-dry vegetation per acre in years of above-normal precipitation and 800 pounds in years of below-normal precipitation.

The potential plant community on the Beaverton soil is mainly needleandthread, plains muhly, western wheatgrass, and bluebunch wheatgrass. If the range is excessively grazed, plains muhly, western wheatgrass, and bluebunch wheatgrass decrease and needleandthread, blue grama, junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as clubmoss, broom snakeweed, and weedlike forbs may invade. The potential plant community will produce about 1,300 pounds of air-dry vegetation per acre in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice on this unit.

Windbreak management.—The Turner soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, Rocky Mountain juniper, green ash, and ponderosa pine. Suitable shrubs are Siberian peashrub, Nanking cherry, Tatarian honeysuckle, common chokecherry, and lilac. The risk of soil blowing can be reduced by cultivating only between the rows of windbreaks. The Beaverton soil is poorly suited to windbreaks because of the very low to low available water capacity.

Homesite development.—If this unit is used for homesite development, it is limited mainly by shrink-swell potential, frost action, and susceptibility of cutbanks to caving in. In the construction of basements or foundations for dwellings, the limitation of shrinking and swelling can be overcome by backfilling with suitable material that has low shrink-swell potential. Frost action can adversely affect the quality of roadbeds and road surfaces. If used as a base for roads and streets, the upper part of the soil can be mixed with the underlying material to increase its strength and stability. Cutbanks are not stable and are subject to slumping. Because the soils in this unit are rapidly permeable to very rapidly permeable, effluent from septic tank absorption fields may contaminate ground water.

This map unit is in capability subclass IVe, nonirrigated. The Turner soil is in Sandy range site, 10- to 14-inch precipitation zone, and the Beaverton soil is in Shallow to Gravel range site, 10- to 14-inch precipitation zone.

59—Turner-Beaverton complex, 8 to 15 percent slopes. This map unit is on uplands. It is throughout the survey area except in the southwestern part of Roosevelt County. Slope is 8 to 15 percent. Slopes are mainly 100 to 250 feet long. Elevation is 2,400 to 3,100 feet.

This unit is about 50 percent Turner sandy loam and 35 percent Beaverton very cobbly sandy loam. The Turner soils are in the less sloping areas of this unit, and the Beaverton soils are in the steeper areas.

Included in this unit are small areas of Farnuf and Tally soils and Beaverton and Turner soils that have a loam surface layer. These areas do not adversely affect the use and management of this unit as rangeland. Also included are small areas of Wabek and Tinsley soils. These soils are more droughty than the Turner and Beaverton soils. Additions of barnyard manure help to overcome this limitation. Included areas make up about 15 percent of the total acreage.

The Turner soil is deep, well drained, and droughty. It formed in outwash. Typically, the Turner soil has a surface layer of dark brown sandy loam 10 inches thick. The upper 11 inches of the subsoil is yellowish brown sandy clay loam, and the lower 3 inches is light olive brown loamy sand. The upper 6 inches of the substratum is grayish brown sand, and the lower part to a depth of 60 inches or more is grayish brown very gravelly sand.

Permeability is moderate to a depth of 21 inches and rapid below this depth. Available water capacity is low to

moderate. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 40 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high.

The Beaverton soil is deep, well drained, and droughty. It formed in outwash. Typically, the Beaverton soil has a surface layer of brown very cobbly sandy loam 4 inches thick. The subsoil is brown and yellowish brown very cobbly sandy clay loam 20 inches thick. The substratum to a depth of 60 inches or more is brown very cobbly loamy sand.

Permeability is moderate to a depth of 24 inches and rapid to very rapid below this depth. Available water capacity is very low to low. Effective rooting deptn is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 40 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is high.

Most areas of this unit are used as rangeland. A few areas are used for nonirrigated cultivated crops. The main nonirrigated crop is spring wheat.

Crop management.—This unit is poorly suited to nonirrigated cultivated crops. It is limited mainly by the hazards of water erosion and soil blowing, droughtiness of the soils, and poor tilth of the Beaverton soil. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. The amount of moisture in the soil can be increased by using tall grass barriers to minimize evaporation and trap snow. Return of crop residue helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces water erosion. Additions of barnyard manure improve the available water capacity.

Range management.—The potential plant community on the Turner soil is mainly needleandthread, thickspike wheatgrass, prairie sandreed, and Indian ricegrass. If the range is excessively grazed, prairie sandreed, thickspike wheatgrass, and Indian ricegrass decrease and needleandthread, blue grama, threadleaf sedge, and fringed sagewort increase. If excessive grazing continues, plants such as cheatgrass, Japanese brome, broom snakeweed, plains pricklypear, and weedlike forbs may invade. The potential plant community will produce about 1,300 pounds of air-dry vegetation per acre in years of above-normal precipitation and 600 pounds in years of below-normal precipitation.

The potential plant community on the Beaverton soil is mainly needleandthread, plains muhly, western wheatgrass, and bluebunch wheatgrass. If the range is excessively grazed, plains muhly, western wheatgrass, and bluebunch wheatgrass decrease and needleandthread, blue grama, junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as clubmoss, broom snakeweed, and weedlike forbs may invade. The potential plant community will produce about 1,100 pounds of air-dry vegetation per acre in years of above-normal precipitation and 500 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice on this unit.

Windbreak management.—The Turner soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, Rocky Mountain juniper, green ash, and ponderosa pine. Suitable shrubs are Siberian peashrub, Nanking cherry, Tatarian honeysuckle, common chokecherry, and lilac. The risk of soil blowing can be reduced by cultivating only between the rows of windbreaks. The Beaverton soil is poorly suited to windbreaks because of the very low to low available water capacity.

Homesite development.—If this unit is used for homesite development, it is limited mainly by slope. Because the soils are rapidly permeable to very rapidly permeable in the lower part, effluent from septic tank absorption fields may contaminate ground water.

This map unit is in capability subclass IVe, nonirrigated. The Turner soil is in Sandy range site, 10- to 14-inch precipitation zone, and the Beaverton soil is in Shallow to Gravel range site, 10- to 14-inch precipitation zone.

60—Typic Fluvaquents, 0 to 2 percent slopes. This unit consists of deep, poorly drained and very poorly drained, wet soils along intermittent and perennial streams and in oxbows, depressional areas, and abandoned stream channels. The soils are throughout the survey area. They formed in deposits of recent alluvium and are subject to flooding. Slope is 0 to 2 percent. Slopes are mainly 10 to 50 feet long. Elevation is 1,875 to 2,900 feet.

Included in this unit are small areas of Fluvaquents, ponded, and Riverwash. These areas produce little, if any, forage. Also included are small areas of Typic Fluvaquents, saline, that produce less forage than the other Typic Fluvaquents in this unit and Typic Ustifluvents and Lallie soils. The Typic Ustifluvents and Lallie soils do not adversely affect the use and management of this unit as rangeland.

Typic Fluvaquents are erratically stratified very gravelly sand to silty clay.

Permeability is very slow to moderate. The available water capacity is moderate to high. Effective rooting depth is 60 inches or more. Where these soils are under native vegetation, the average annual wetting depth is more than 60 inches. Runoff is ponded to slow, and the hazard of water erosion is moderate. The hazard of soil blowing is slight. These soils commonly have a water table within 36 inches of the surface throughout the year. They are subject to frequent periods of flooding. Channeling and deposition are common along streambanks.

This unit is used mainly as rangeland.

Crop management.—This unit is poorly suited to cultivated crops. It is limited mainly by frequent periods of flooding, wetness, and the variability in soil texture.

Range management.—The potential plant community is mainly tall reedgrasses, prairie cordgrass, tall sedges, and American sloughgrass. If the range is excessively grazed, these plants decrease and low sedges, tufted hairgrass, Baltic rush, and western wheatgrass increase. If excessive grazing continues, plants such as Kentucky bluegrass, curly dock, foxtail barley, and Canada thistle may invade. The potential plant community will produce about 4,000 pounds of air-dry vegetation per acre in years of above-normal precipitation and 3,000 pounds in years of below-normal precipitation.

Grazing should be delayed until the soil in this unit has drained sufficiently and is firm enough to withstand trampling by livestock.

Windbreak management.—This unit is poorly suited to windbreaks mainly because of wetness.

Homesite development.—This unit is poorly suited to homesite development. It is limited mainly by the frequent periods of flooding and wetness.

This map unit is in capability subclass VIw, nonirrigated. It is in Wet Meadow range site, 10- to 14-inch precipitation zone.

61—Typic Ustifluvents, 0 to 2 percent slopes. This unit consists of deep, well drained and moderately well drained soils on flood plains. It is throughout the survey area except in the southwestern part of Roosevelt County. The soils formed in deposits of recent alluvium and are subject to flooding. Slope is 0 to 2 percent. Slopes are mainly 10 to 200 feet long. Elevation is 1,875 to 2,900 feet.

Included in this unit are small areas of Ustifluvents, saline, and Riverwash. These areas produce less forage than the rest of this unit.

Typic Ustifluvents are erratically stratified gravelly loamy sand to silty clay.

Permeability is very slow to very rapid. Available water capacity is very low to high. Effective rooting depth is 60 inches or more. Where these soils are under native vegetation, the average annual wetting depth is 15 to 60 inches or more. Runoff is slow to medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight. This unit is subject to frequent periods of flooding. Channeling and deposition are common along streambanks.

This unit is used mainly as rangeland.

Crop management.—This unit is poorly suited to cultivated crops. It is limited mainly by flooding and the variability in soil texture.

Range management.—The potential plant community is mainly western wheatgrass, green needlegrass, porcupinegrass, and winterfat. If the range is excessively grazed, these plants decrease and needleandthread, fringed sagewort, silver sagebrush, and perennial forbs increase. If excessive grazing continues, plants such as Kentucky bluegrass, Canada bluegrass, and weedlike forbs may invade. The potential plant community will produce about 2,500 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,500 pounds in years of below-normal precipitation. In places, brush control improves production of desirable forage plants.

Windbreak management.—This unit is poorly suited to windbreaks mainly because of the variability in soil texture and the dissected pattern of the unit.

Homesite development.—This unit is poorly suited to homesite development. It is limited mainly by the frequent periods of flooding.

This map unit is in capability subclass VIw, nonirrigated. It is in Overflow range site, 10- to 14-inch precipitation zone.

62—Ustic Torrifluvents, 0 to 2 percent slopes. This unit consists of deep, well drained and moderately well drained soils on flood plains. It is in the southwestern part of Roosevelt County. The soils formed in deposits of recent alluvium and are subject to flooding. Slope is 0 to 2 percent. Slopes are mainly 10 to 200 feet long. Elevation is 1,875 to 2,500 feet.

Included in this unit are small areas of saline soils that are variable in texture and have drainage similar to that of the Ustic Torrifluvents. Also included are small areas of Riverwash and Typic Fluvaquents. The areas of saline soils and Riverwash produce less forage than the Ustic Torrifluvents. The Typic Fluvaquents do not adversely affect the use and management of this unit as rangeland.

Ustic Torrifluvents are erratically stratified gravelly loamy sand to silty clay.

Permeability is very slow to very rapid. Available water capacity is very low to high. Effective rooting depth is 60 inches or more. Where these soils are under native vegetation, the average annual wetting depth is 15 inches to more than 60 inches. Runoff is slow to medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight. These soils are subject to frequent periods of flooding. Channeling and deposition are common along streambanks.

This unit is used mainly as rangeland.

Crop management.—This unit is poorly suited to cultivated crops. It is limited mainly by flooding and the variability in soil texture.

Range management.—The potential plant community is mainly western wheatgrass, green needlegrass, porcupinegrass, and winterfat. If the range is excessively grazed, these plants decrease and needleandthread, fringed sagewort, silver sagebrush, and perennial forbs increase. If excessive grazing continues, plants such as Kentucky bluegrass, Canada bluegrass, and weedlike forbs may invade. The potential plant community will produce about 2,400 pounds of air-dry vegetation per

acre in years of above-normal precipitation and 1,400 pounds in years of below-normal precipitation. In places, brush control improves production of desirable forage plants.

Windbreak management.—This unit is poorly suited to windbreaks mainly because of the variability in soil texture.

Homesite development.—This unit is poorly suited to homesite development. It is limited mainly by the frequent periods of flooding.

This map unit is in capability subclass VIw, nonirrigated. It is in Overflow range site, 10- to 14-inch precipitation zone.

63—Ustifluvents, saline, 0 to 2 percent slopes. This unit consists of deep, moderately well drained, strongly salt-affected soils on flood plains. The soils are throughout the survey area. They formed in recent deposits of alluvium and are subject to flooding. Slope is 0 to 2 percent. Slopes are mainly 10 to 200 feet long. Elevation is 1,875 to 2,900 feet.

Included in this unit are small areas of sodium-affected soils that are variable in texture and small areas of Riverwash. These areas produce less forage than do the Ustifluvents, saline. Also included are small areas of Fluvaquents, saline. These areas do not adversely affect the use and management of this unit as rangeland.

Ustifluvents, saline, are erratically stratified very gravelly sand to clay.

Permeability is very slow to moderate. Available water capacity is very low to moderate. Effective rooting depth is 60 inches or more. Where these soils are under native vegetation, the average annual wetting depth is 15 inches to more than 60 inches. Runoff is slow to medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight. These soils are subject to frequent periods of flooding. They commonly have a water table at a depth of 36 to 60 inches or more. Channeling and deposition are common along streambanks.

This unit is used mainly as rangeland.

Crop management.—This unit is poorly suited to cultivated crops. It is limited mainly by flooding, strong salinity, and wetness.

Range management.—The potential plant community is mainly alkali cordgrass, Nuttall saltbush, Nuttall alkaligrass, and alkali sacaton. If the range is excessively grazed, these plants decrease and inland saltgrass, bottlebrush squirreltail, and greasewood increase. If excessive grazing continues, plants such as foxtail barley and weedlike forbs may invade. The potential plant community will produce about 1,300 pounds of air-dry vegetation per acre in years of above-normal precipitation and 900 pounds in years of below-normal precipitation. Mechanical treatment practices are not practical.

Windbreak management.—This unit is poorly suited to windbreaks mainly because of strong salinity.

Homesite development.—This unit is poorly suited to homesite development. It is limited mainly by the frequent periods of flooding.

This map unit is in capability subclass VIIw, nonirrigated. It is in Saline Lowland range site, 10- to 14-inch precipitation zone.

64—Vanda Variant silty clay, 4 to 10 percent slopes. This deep, well drained, moderately salt-affected soil is on fans on uplands, mainly in the southwestern and south-central parts of Roosevelt County. The soil formed in alluvium. Slope is 4 to 10 percent. Slopes are mainly 300 to 1,000 feet long. Elevation is 2,000 to 2,500 feet.

Included in this unit are small areas of Lisam and Thebo soils. Also included are small areas of deep silty clay soils that are slightly acid or medium acid in the underlying material. The included areas produce less vegetation than this Vanda Variant soil.

Typically, the Vanda Variant soil has a surface layer of light brownish gray silty clay 8 inches thick. The upper 16 inches of the underlying material is light brownish gray silty clay loam, the next 24 inches is light brownish gray silty clay, and the lower part to a depth of 60 inches or more is grayish brown clay.

Permeability is very slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. This soil is moderately salt-affected at a depth of about 8 inches.

This soil is used mainly as rangeland.

Crop management.—This soil is poorly suited to cultivated crops. It is limited mainly by the moderate content of salt, surface crusting, and hardness of the soil when dry.

Range management.—The potential plant community is mainly western wheatgrass, green needlegrass, winterfat, and plains muhly. If the range is excessively grazed, these plants decrease and plains reedgrass, Sandberg bluegrass, silver sagebrush, and blue grama increase. If excessive grazing continues, plants such as broom snakeweed, greasewood, sweetclover, plains pricklypear, and weedlike forbs may invade. The potential plant community will produce about 1,000 pounds of air-dry vegetation per acre in years of above-normal precipitation and 500 pounds in years of below-normal precipitation. Where a source of water from runoff is available, yields can be increased by the use of water spreading.

Windbreak management.—This soil is poorly suited to windbreaks mainly because of the moderate content of salt.

Homesite development.—If this soil is used for homesite development, it is limited mainly by the very slow permeability, shrink-swell potential, low soil strength, and slope in some areas. If the soil is used for septic tank absorption fields, the limitation of very slow permeability can be overcome by increasing the size of the absorption field. The steepness of slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. If buildings are constructed on this soil, properly design foundations and footings and divert runoff away from buildings to help prevent structural damage as a result of shrinking and swelling. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IVe, nonirrigated. It is in Clayey range site, 10- to 14-inch precipitation zone.

65—Vanda Variant-Thebo-Lisam complex, 4 to 15 percent slopes. This map unit is on fans and foot slopes of uplands in the southwestern and south-central parts of Roosevelt County. Slope is 4 to 15 percent. Slopes are mainly 300 to 500 feet long. Elevation is 2,000 to 2,500 feet.

This unit is about 45 percent Vanda Variant silty clay that has slopes of 4 to 10 percent, 30 percent Thebo clay that has slopes of 4 to 15 percent, and 15 percent Lisam silty clay that has slopes of 6 to 10 percent. The Vanda Variant soil is in the less sloping areas of this unit, and the Thebo and Lisam soils are in the steeper areas.

Included in this unit are small areas of Zahill and Hillon soils, Thebo and Lisam soils that have slopes of more than 15 percent, and shale outcroppings. Also included are small areas of soils that are similar to the Vanda Variant, Thebo, and Lisam soils but are slightly acid or medium acid in the underlying material. Included areas make up about 10 percent of the total acreage. The Zahill and Hillon soils do not adversely affect the use and management of this unit as rangeland. The more steeply sloping areas of Thebo and Lisam soils and the soils that are similar to the Vanda Variant, Thebo, and Lisam soils produce less vegetation than the rest of the unit. The shale outcroppings have limited potential for the production of forage.

The Vanda Variant soil is deep, well drained, and moderately salt-affected. It formed in alluvium and is on fans. Typically, the Vanda Variant soil has a surface layer of light brownish gray silty clay 8 inches thick. The upper 16 inches of the underlying material is light brownish gray silty clay loam, the next 24 inches is light brownish gray silty clay, and the lower part to a depth of 60 inches or more is grayish brown clay.

Permeability is very slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. This soil is moderately salt-affected at a depth of about 8 inches.

The Thebo soil is moderately deep, well drained, and droughty. It formed in material derived from consolidated shale and is on uplands. Typically, the Thebo soil has a surface layer of grayish brown clay 2 inches thick. The underlying material to a depth of 32 inches is grayish brown clay. Below this to a depth of 60 inches or more is gray, consolidated shale. Consolidated shale is at a depth of 20 to 40 inches.

Permeability is very slow, and available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. Where this soil is under native vegetation, the average annual wetting depth is about 21 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Lisam soil is shallow, well drained, and very droughty. It formed in material derived from consolidated shale and is on uplands. Typically, the Lisam soil has a surface layer of light brownish gray silty clay 4 inches thick. The underlying material to a depth of 17 inches is light brownish gray silty clay. Below this to a depth of 60 inches or more is consolidated shale. Consolidated shale is at a depth of 10 to 20 inches.

Permeability is very slow, and available water capacity is very low. Effective rooting depth is 10 to 20 inches. Where this soil is under native vegetation, the average annual wetting depth is about 17 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This unit is used mainly as rangeland.

Crop management.—This unit is poorly suited to cultivated crops. It is limited mainly by slope, poor tilth of the soils, the moderate salinity of the Vanda Variant soil, and droughtiness of the Thebo and Lisam soils.

Range management.—The potential plant community on the Vanda Variant soil is mainly western wheatgrass, green needlegrass, winterfat, and plains muhly. If the range is excessively grazed, these plants decrease and plains reedgrass, Sandberg bluegrass, blue grama, and silver sagebrush increase. If excessive grazing continues, plants such as broom snakeweed, greasewood, sweetclover, plains pricklypear, and weedlike forbs may invade. The potential plant community will produce about 1,000 pounds of air-dry vegetation per acre in years of above-normal precipitation and 500 pounds in years of below-normal precipitation.

The potential plant community on the Thebo soil is mainly western wheatgrass, green needlegrass, plains muhly, and winterfat. If the range is excessively grazed, these plants decrease and plains reedgrass, Sandberg bluegrass, blue grama, and silver sagebrush increase. If

excessive grazing continues, plants such as broom snakeweed, plains pricklypear, sweetclover, clubmoss, and weedlike forbs may invade. The potential plant community will produce about 1,300 pounds of air-dry vegetation per acre in years of above-normal precipitation and 500 pounds in years of below-normal precipitation.

The potential plant community on the Lisam soil is mainly western wheatgrass, green needlegrass, Montana wheatgrass, and plains reedgrass. If the range is excessively grazed, western wheatgrass, green needlegrass, and Montana wheatgrass decrease and plains reedgrass, blue grama, Sandberg bluegrass, fringed sagewort, and rubber rabbitbrush increase. If excessive grazing continues, plants such as broom snakeweed, cheatgrass, Japanese brome, sweetclover, and weedlike forbs may invade. The potential plant community will produce about 800 pounds of air-dry vegetation per acre in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

The surface layer of the soils in this unit is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This unit is poorly suited to windbreaks mainly because of the shallow depth to consolidated shale in the Lisam soil, the droughtiness of the Thebo and Lisam soils, and the moderate salinity of the Vanda Variant soil.

Homesite development.—If this unit is used for homesite development, it is limited mainly by slope in some areas, depth to consolidated shale in the Thebo and Lisam soils, the very slow permeability, shrink-swell potential, and low soil strength. If buildings are constructed on this unit, properly design foundations and footings and divert runoff away from buildings to help prevent structural damage as a result of shrinking and swelling. The Thebo and Lisam soils are subject to slippage. Onsite inspection is advisable to determine the degree of this hazard. If this unit is used for septic tank absorption fields, the limitation of very slow permeability can be overcome by increasing the size of the absorption field. The steepness of slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Effluent from absorption fields can surface in downslope areas and create a hazard to health. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass VIe, nonirrigated. The Vanda Variant and Thebo soils are in Clayey range site, 10- to 14-inch precipitation zone, and the Lisam soil is in Shallow to Clay range site, 10- to 14-inch precipitation zone.

66—Wabek-Cabba-Tinsley complex, 15 to 45 percent slopes. This map unit is on outwash plains and terraces on uplands throughout the survey area except the southwestern part of Roosevelt County. Slope is 15 to 45 percent. Slopes are mainly 50 to 200 feet long. Elevation is 2,200 to 3,100 feet.

This unit is about 45 percent Wabek sandy loam, 25 percent Cabba silt loam, and 20 percent Tinsley very gravelly sandy loam. The Cabba soil is in the steeper areas of this unit, and the Wabek and Tinsley soils are in the less sloping areas.

Included in mapping and making up 10 percent of the unit are small areas of Beaverton, Cambert, and Tally soils and small areas of Wabek soils that have a gravelly sandy loam, loam, or gravelly loam surface layer. These included soils do not adversely affect the use and management of this unit as rangeland.

The Wabek soil is deep, excessively drained, and very droughty. It formed in outwash gravel and is on outwash plains and terraces. Typically, the surface layer is dark grayish brown sandy loam 7 inches thick. The upper 12 inches of the underlying material is pale brown very gravelly sandy loam, the next 14 inches is pale brown gravelly sand, and the lower part to a depth of 60 inches or more is pale brown very gravelly sand.

Permeability is rapid to a depth of 19 inches and very rapid below this depth. Available water capacity is very low. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The Cabba soil is shallow, well drained, and droughty. It formed in material derived from weakly consolidated sedimentary beds and is on outwash plains and terraces. Typically, the surface layer is light brownish gray silt loam 5 inches thick. The underlying material to a depth of 18 inches is light brownish gray silt loam. Below this to a depth of 60 inches or more are weakly consolidated sedimentary beds. Weakly consolidated sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low to low. Effective rooting depth is limited by the weakly consolidated sedimentary beds at a depth of about 18 inches. Where this soil is under native vegetation, the average annual wetting depth is about 18 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

The Tinsley soil is deep, excessively drained, and very droughty. It formed in outwash and is on terraces. Typically, the surface layer is brown very gravelly sandy loam 3 inches thick. The underlying material to a depth of 60 inches or more is pale brown very gravelly sand.

Permeability is rapid, and available water capacity is very low. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

Most areas of this unit are used as rangeland. A few areas are used as a source of sand and gravel.

Crop management.—This unit is poorly suited to cultivated crops. It is limited mainly by slope, droughtiness, and poor soil tilth.

Range management.—The potential plant community on the Wabek and Tinsley soils is mainly bluebunch wheatgrass, needleandthread, western wheatgrass, and plains muhly. If the range is excessively grazed, bluebunch wheatgrass, western wheatgrass, and plains muhly decrease and needleandthread, blue grama, perennial forbs, and fringed sagewort increase. If excessive grazing continues, plants such as clubmoss, broom snakeweed, and weedlike forbs may invade.

The potential plant community on the Wabek soil produces about 1,050 pounds of air-dry vegetation per acre in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

The potential plant community on the Tinsley soil produces about 750 pounds of air-dry vegetation per acre in years of above-normal precipitation and 350 pounds in years of below-normal precipitation.

The potential plant community on the Cabba soil is mainly little bluestem, sideoats grama, green needlegrass, and plains muhly. If the range is excessively grazed, these plants decrease and needleandthread, blue grama, junegrass, Sandberg bluegrass, and fringed sagewort increase. If excessive grazing continues, plants such as brown snakeweed, annuals, and weedlike forbs may invade. The potential plant community will produce about 700 pounds of air-dry vegetation per acre in years of above-normal precipitation and 300 pounds in years of below-normal precipitation.

This unit is not suited to practices such as mechanical treatment because it is droughty and is more susceptible to soil blowing and water erosion if it is disturbed. Reestablishing plant cover is difficult.

Windbreak management.—This unit is poorly suited to windbreaks. It is limited mainly by droughtiness and steepness of slope.

Homesite development.—The main limitation of this unit for homesite development is steepness of slope.

This map unit is in capability subclass VIIe, nonirrigated. The Wabek and Tinsley soils are in Gravel range site, 10- to 14-inch precipitation zone, and the Cabba soil is in Shallow range site, 10- to 14-inch precipitation zone.

67—Wabek-Tinsley complex, 8 to 15 percent slopes. This map unit is on outwash plains and terraces on uplands. It is throughout the survey area except in the southwestern part of Roosevelt County. Slope is 8 to 15 percent. Slopes are mainly 50 to 300 feet long. Elevation is 2,200 to 3,100 feet.

This unit is about 50 percent Wabek sandy loam and 40 percent Tinsley very gravelly sandy loam. The Wabek soil is in the less sloping areas of this unit, and the Tinsley soil is in the steeper areas.

Included in this unit are small areas of Beaverton, Tally, and Turner soils. Also included are small areas of Wabek soils that have a gravelly sandy loam, loam, or gravelly loam surface layer. Included areas make up about 10 percent of the total acreage. These areas do not adversely affect the use and management of this unit as rangeland.

The Wabek soil is deep, excessively drained, and very droughty. It formed in outwash gravel and is on outwash plains and terraces. Typically, the surface layer is dark grayish brown sandy loam 7 inches thick. The upper 12 inches of the underlying material is pale brown very gravelly sandy loam, the next 14 inches is pale brown gravelly sand, and the lower part to a depth of 60 inches or more is pale brown very gravelly sand.

Permeability is rapid to a depth of 19 inches and very rapid below this depth. Available water capacity is very low. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is 60 inches or more. Runoff is slow to medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The Tinsley soil is deep, excessively drained, and very droughty. It formed in outwash and is on terraces. Typically, the surface layer is brown very gravelly sandy loam 3 inches thick. The underlying material to a depth of 60 inches or more is pale brown very gravelly sand.

Permeability is rapid, and available water capacity is very low. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

Most areas of this unit are used as rangeland. A few areas are used as a source of sand and gravel.

Crop management.—This unit is poorly suited to cultivated crops. It is limited mainly by slope, droughtiness, and poor soil tilth.

Range management.—The potential plant community on this unit is mainly bluebunch wheatgrass, needleandthread, western wheatgrass, and plains muhly. If the range is excessively grazed, bluebunch wheatgrass, western wheatgrass, and plains muhly decrease and needleandthread, blue grama, perennial forbs, and fringed sagewort increase. If excessive grazing continues, plants such as clubmoss, broom snakeweed, and weedlike forbs may invade.

The potential plant community on the Wabek soil produces about 1,150 pounds of air-dry vegetation per

acre in years of above-normal precipitation and 550 pounds in years of below-normal precipitation.

The potential plant community on the Tinsley soil produces about 900 pounds of air-dry vegetation per acre in years of above-normal precipitation and 450 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice on this unit.

Windbreak management.—This unit is poorly suited to windbreaks because of the very low available water capacity.

Homesite development.—If this unit is used for homesite development, it is limited mainly by slope, susceptibility to slumping, and the rapid and very rapid permeability. Effluent from septic tank absorption fields may contaminate ground water. Cutbanks are not stable and are subject to slumping.

This map unit is in capability subclass VIe, nonirrigated. It is in Gravel range site, 10- to 14-inch precipitation zone.

68—Williams loam, 0 to 2 percent slopes. This deep, well drained soil is on uplands. It is throughout the survey area except in the southwestern part of Roosevelt County. The soil formed in glacial till. Slope is 0 to 2 percent. Slopes are mainly 500 to 1,000 feet long. Elevation is 2,000 to 3,000 feet.

Included in this unit are small areas of Savage, Farnuf, and Martinsdale soils and Williams soils that have a clay loam surface layer. These areas do not adversely affect the use and management of this unit for nonirrigated cultivated crops. Also included are small areas of Nishon soils. The Nishon soils are in small depressional areas and lake basins that are subject to ponding. Ponding interferes with seeding.

Typically, the Williams soil, where mixed to a depth of 7 inches, has a surface layer of dark grayish brown loam. The subsoil is dark grayish brown and light brownish gray clay loam 24 inches thick. The substratum to a depth of 60 inches or more is light brownish gray and grayish brown clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 35 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This soil is used mainly for nonirrigated cultivated crops, for grass-legume hay, and as rangeland. The main nonirrigated crops are spring wheat, winter wheat, and barley.

Crop management.—This soil is well suited to nonirrigated cultivated crops. It is limited mainly by the hazard of soil blowing. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. Some areas of this unit have glacial stones and boulders on the surface. These stones and boulders have been removed from most cultivated areas, and they have been piled along field borders.

Range management.—The potential plant community is mainly western wheatgrass, needleandthread, green needlegrass, and winterfat. If the range is excessively grazed, western wheatgrass, winterfat, and green needlegrass decrease and needleandthread, little porcupinegrass, blue grama, junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as clubmoss, cheatgrass, sixweeks fescue, and weedlike forbs may invade. The potential plant community will produce about 1,800 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,100 pounds in years of below-normal precipitation. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Siberian elm, green ash, Rocky Mountain juniper, ponderosa pine, and blue spruce. Suitable shrubs are Siberian peashrub, American plum, Tatarian honeysuckle, and common chokecherry.

Homesite development.—If this soil is used for homesite development, it is limited mainly by the slow permeability, shrink-swell potential, and low soil strength. If the soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

69—Williams loam, 2 to 8 percent slopes. This deep, well drained soil is on uplands. It is throughout the survey area except in the southwestern part of Roosevelt County. The soil formed in glacial till. Slope is 2 to 8 percent. Slopes are mainly 200 to 1,000 feet long. Elevation is 2,000 to 3,000 feet.

Included in this unit are small areas of Farnuf, Dooley, Savage, and Bowbells soils and Williams soils that have a clay loam surface layer. These areas do not adversely affect the use and management of this unit for nonirrigated cultivated crops. Also included are small areas of Zahill, Zahl, and Nishon soils and Williams loam that has slopes of more than 8 percent. The Nishon soils are in small depressional areas and lake basins that are subject to ponding. Ponding interferes with seeding. The Zahill and Zahl soils are in the steeper areas of this unit and they produce lower yields than this Williams soil.

Yields can be improved by addition of barnyard manure and phosphate fertilizer. The areas of Williams loam that have slopes of more than 8 percent are more susceptible to water erosion; therefore, they should be cultivated on the contour.

Typically, the Williams soil, where mixed to a depth of 7 inches, has a surface layer of dark grayish brown loam. The subsoil is dark grayish brown and light brownish gray clay loam 24 inches thick. The substratum to a depth of 60 inches or more is light brownish gray and grayish brown clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used mainly for nonirrigated cultivated crops, for grass-legume hay, and as rangeland. The main nonirrigated crops are spring wheat, winter wheat, and barley.

Crop management.—If this soil is used for nonirrigated cultivated crops, it is limited by the hazards of water erosion and soil blowing. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. The amount of moisture in the soil can be increased by using tall grass barriers to minimize evaporation and trap snow. Return of crop residue helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces water erosion. Some areas of this unit have glacial stones and boulders on the surface. These stones and boulders have been removed from most cultivated areas, and they have been piled along field borders.

Range management.—The potential plant community is mainly western wheatgrass, needleandthread, green needlegrass, and winterfat. If the range is excessively grazed, western wheatgrass, winterfat, and green needlegrass decrease and needleandthread, little porcupinegrass, blue grama, junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as cheatgrass, sixweeks fescue, clubmoss, and weedlike forbs may invade. The potential plant community will produce about 1,700 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Siberian elm, green ash, Rocky Mountain juniper, ponderosa pine, and blue spruce. Suitable shrubs are Siberian peashrub, American plum, Tatarian honeysuckle, and common chokecherry.

Homesite development.—If this soil is used for homesite development, it is limited mainly by the slow permeability, shrink-swell potential, and low soil strength. If the soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

70—Williams-Zahill loams, 2 to 8 percent slopes. This map unit is on uplands. It is throughout the survey area except in the southwestern part of Roosevelt County. Slope is 2 to 8 percent. Slopes are mainly 100 to 500 feet long. Elevation is 2,000 to 3,000 feet.

This unit is about 65 percent Williams loam and 25 percent Zahill loam. The Williams soil is in the less sloping areas of this unit, and the Zahill soil is in the steeper areas.

Included in this unit are small areas of Bowbells, Zahl, Savage, Farnuf, and Nishon soils. Also included are small areas of Williams and Zahill soils that have slopes of more than 8 percent. The Bowbells, Zahl, Savage, and Farnuf soils do not adversely affect the use and management of this unit for nonirrigated cultivated crops. The Nishon soils are in small depressional areas and lake basins that are subject to ponding. Ponding interferes with seeding. The areas of Williams and Zahill soils that have slopes of more than 8 percent are more susceptible to water erosion; therefore, they should be cultivated on the contour. Included areas make up about 10 percent of the total acreage.

The Williams soil is deep and well drained. It formed in glacial till. Typically, the Williams soil, where mixed to a depth of 7 inches, has a surface layer of dark grayish brown loam. The subsoil is dark grayish brown and light brownish gray clay loam 24 inches thick. The substratum to a depth of 60 inches or more is light brownish gray and grayish brown clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Zahill soil is deep and well drained. It formed in glacial till. Typically, the Zahill soil has a surface layer of grayish brown loam 7 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray and grayish brown clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 28 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. This soil is calcareous throughout.

This unit is used mainly for nonirrigated cultivated crops, for grass-legume hay, and as rangeland. The main nonirrigated crops are spring wheat, winter wheat, and barley.

Crop management.—If this unit is used for nonirrigated cultivated crops, it is limited by the hazards of water erosion and soil blowing. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. The amount of moisture in the soil can be increased by using tall grass barriers to minimize evaporation and trap snow. Return of crop residue helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces water erosion. The Zahill soil normally produces lower yields than the Williams soils. Yields can be improved by addition of barnyard manure and phosphate fertilizer. Some areas of this unit have glacial stones and boulders on the surface. These stones and boulders have been removed from most cultivated areas, and they have been piled along field borders.

Range management.—The potential plant community is mainly western wheatgrass, needleandthread, green needlegrass, and winterfat. If the range is excessively grazed, western wheatgrass, winterfat, and green needlegrass decrease and needleandthread, little porcupinegrass, blue grama, junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as cheatgrass, sixweeks fescue, clubmoss, and weedlike forbs may invade.

The potential plant community on the Williams soil produces about 1,700 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation.

The potential plant community on the Zahill soil produces about 1,500 pounds of air-dry vegetation per acre in years of above-normal precipitation and 800 pounds in years of below-normal precipitation. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice on this unit.

Windbreak management.—This unit is suited to windbreaks. Suitable trees for planting are Siberian elm, green ash, Rocky Mountain juniper, ponderosa pine, and blue spruce. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and common chokecherry. The risk of soil blowing can be reduced by cultivating only between the rows of windbreaks.

Homesite development.—If this unit is used for homesite development, it is limited mainly by the slow permeability, shrink-swell potential, and low soil strength. If the unit is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field. In the construction of basements or foundations for dwellings, the limitation of shrink-swell potential can be overcome by backfilling with suitable material that has low shrink-swell potential. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

71—Zahill loam, 8 to 15 percent slopes. This deep, well drained soil is on uplands. It is throughout the survey area except in the southwestern part of Roosevelt County. The soil formed in glacial till. Slope is 8 to 15 percent. Slopes are mainly 50 to 500 feet long. Elevation is 2,000 to 3,000 feet.

Included in this unit are small areas of Williams, Farnuf, Zahl, and Zahill clay loams and alluvial soils, in drainageways, that have a thicker and darker colored surface layer than that of this Zahill soil. These areas do not adversely affect the use and management of this unit as rangeland. Also included are small areas of Zahill gravelly loam and Zahill soils that have slopes of more than 15 percent. The areas of Zahill gravelly loam may interfere with tillage. The areas of Zahill soils that have slopes of more than 15 percent can be farmed around.

Typically, the Zahill soil has a surface layer of grayish brown loam 5 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray and grayish brown clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is medium to rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

This soil is used mainly as rangeland. It is also used for nonirrigated cultivated crops. The main nonirrigated crops are spring wheat and barley.

Crop management.—This soil is poorly suited to nonirrigated cultivated crops. It is limited mainly by the hazards of water erosion and soil blowing. All tillage should be on the contour or across the slope. Keeping tillage at a minimum maintains tilth, increases the water intake rate, and reduces the risk of erosion. The surface layer is high in content of lime and low in content of organic matter. Crops respond well to the application of phosphorus and nitrogen. Using green manure crops, barnyard manure, and crop residue increases organic matter content and fertility. On long slopes, chiseling the stubble in fall, either on the contour or across the slope, slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling

also promotes better aeration. Some areas of this soil have glacial stones and boulders on the surface. These stones and boulders have been removed from most cultivated areas, and they have been piled along field borders.

Range management.—The potential plant community is mainly western wheatgrass, needleandthread, green needlegrass, and winterfat. If the range is excessively grazed, western wheatgrass, winterfat, and green needlegrass decrease and needleandthread, little porcupinegrass, blue grama, junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as cheatgrass, sixweeks fescue, clubmoss, and weedlike forbs may invade. The potential plant community will produce about 1,300 pounds of air-dry vegetation per acre in years of above-normal precipitation and 600 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Where clubmoss and blue grama are the dominant vegetation, practices such as pitting, furrowing, or chiseling can be used to improve areas of depleted rangeland. Such practices increase the water intake rate, reduce plant competition, and allow the more desirable native plants to increase. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. The included alluvial soils produce a significant amount of the total forage on this unit.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, Rocky Mountain juniper, ponderosa pine, green ash, and blue spruce. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, and common chokecherry.

Homesite development.—If this soil is used for homesite the development, it is limited mainly by slope, low soil strength, the slow permeability, and shrink-swell potential. If buildings are constructed on this soil, properly design foundations and footings and divert runoff away from buildings to help prevent structural damage as a result of shrinking and swelling. If the soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field. The steepness of slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Effluent from absorption fields can surface in downslope areas and create a hazard to health. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IVe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

72—Zahill loam, 15 to 45 percent slopes. This deep, well drained soil is on uplands. It is throughout the survey area except in the southwestern part of Roosevelt County. The soil formed in glacial till. Slope is 15 to 45 percent. Slopes are mainly 50 to 400 feet long. Elevation is 2,000 to 3,000 feet.

Included in this unit are small areas of Farnuf, Cambert, and Zahl soils; Zahill gravelly loam; Zahill clay loam; and alluvial soils, in drainageways, that have a thicker and darker colored surface layer that does this Zahill soil. These areas do not adversely affect the use and management of this unit as rangeland. Also included are small areas of Cabba, Tinsley, and Wabek soils. These soils produce less vegetation than does this Zahill soil.

Typically, the Zahill soil has a surface layer of grayish brown loam 3 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray and grayish brown clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 18 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

This soil is used mainly as rangeland.

Crop management.—This soil is poorly suited to cultivated crops. It is limited mainly by slope.

Range management.—The potential plant community is mainly western wheatgrass, plains muhly, green needlegrass, and little bluestem. If the range is excessively grazed, these plants decrease and needleandthread, little porcupinegrass, blue grama, junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as clubmoss, broom snakeweed, and weedlike forbs may invade. The potential plant community will produce about 900 pounds of air-dry vegetation per acre in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas. Trails or walkways can be constructed to encourage livestock grazing in areas where access is limited. Mechanical treatment practices are not practical. The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. The included alluvial soils produce a significant amount of the total forage on this unit.

Windbreak management.—This soil is poorly suited to windbreaks because of slope.

Homesite development.—The main limitation of this soil for homesite development is steepness of slope.

This map unit is in capability subclass VIe, nonirrigated. It is in Thin Hilly range site, 10- to 14-inch precipitation zone.

73—Zahill-Cabba-Cambert complex, 8 to 15 percent slopes. This map unit is on uplands, mainly in the eastern half of Roosevelt County and in most of Daniels County. Slope is 8 to 15 percent. Slopes are mainly 50 to 500 feet long. Elevation is 2,000 to 3,100 feet.

This unit is about 40 percent Zahill loam, 30 percent Cabba silt loam, and 20 percent Cambert silt loam. The Cabba soil is in the steeper areas of this unit, the Cambert soil is in the less sloping areas, and the Zahill soil is in the higher lying areas.

Included in this unit are small areas of Tally, Zahl, and Cherry soils and alluvial soils, in drainageways, that have a thicker and darker colored surface layer than does this Zahill soil. These areas do not adversely affect the use and management of this unit for nonirrigated cultivated crops. Also included are small areas of Zahill, Cabba, and Cambert soils that have slopes of more than 15 percent. These areas can be farmed around. Included areas make up about 10 percent of the total acreage.

The Zahill soil is deep and well drained. It formed in glacial till. Typically, the Zahill soil has a surface layer of grayish brown loam 5 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray and grayish brown clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is medium to rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

The Cabba soil is shallow, well drained, and droughty. It formed in material derived from weakly consolidated sedimentary beds. Typically, the surface layer is light brownish gray silt loam 5 inches thick. The underlying material to a depth of 18 inches is light brownish gray silt loam. Below this to a depth of 60 inches or more are weakly consolidated sedimentary beds. Weakly consolidated sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low to low. Effective rooting depth is limited by the weakly consolidated sedimentary beds. Where this soil is under native vegetation, the average annual wetting depth is about 18 inches. Runoff is medium to rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

The Cambert soil is moderately deep, well drained, and droughty. It formed in material derived from weakly consolidated sedimentary beds. Typically, the surface layer is brown silt loam 4 inches thick. The subsoil is pale brown silt loam 20 inches thick. The substratum is pale yellow silt loam 6 inches thick. Below this to a depth of 60 inches or more are weakly consolidated sedimentary beds. Weakly consolidated sedimentary beds are at a depth of 20 to 36 inches.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is limited by the weakly consolidated sedimentary beds. Where this soil is under native vegetation, the average annual wetting depth is about 30 inches. Runoff is medium to rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

This unit is used mainly for nonirrigated cultivated crops and as rangeland. The main nonirrigated crops are spring wheat and barley.

Crop management.—This unit is poorly suited to nonirrigated cultivated crops. It is limited mainly by the hazards of water erosion and soil blowing and by droughtiness of the Cambert and Cabba soils. Additions of barnyard manure improve the available water capacity. Plowing the Cabba soil to a depth of about 2 to 3 feet improves the available water capacity. All tillage should be on the contour or across the slope. Minimum tillage, contour cultivation, grassed waterways, and stubble mulch tillage reduce soil blowing and water erosion.

Range management.—The potential plant community on the Zahill and Cambert soils is mainly western wheatgrass, green needlegrass, little bluestem, and needleandthread. If the range is excessively grazed, western wheatgrass, green needlegrass, and little bluestem decrease and needleandthread, little porcupinegrass, blue grama, junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as cheatgrass, sixweeks fescue, clubmoss, and weedlike forbs may invade.

The potential plant community on the Zahill soil produces about 1,300 pounds of air-dry vegetation per acre in years of above-normal precipitation and 600 pounds in years of below-normal precipitation.

The potential plant community on the Cambert soil produces about 1,000 pounds of air-dry vegetation per acre in years of above-normal precipitation and 600 pounds in years of below-normal precipitation.

The potential plant community on the Cabba soil is mainly little bluestem, western wheatgrass, green needlegrass, and plains muhly. If the range is excessively grazed, these grasses decrease and needleandthread, blue grama, junegrass, Sandberg bluegrass, and fringed sagewort increase. If excessive grazing continues, plants such as broom snakeweed, annuals, and weedlike forbs may invade. The potential plant community will produce about 800 pounds of air-dry vegetation per acre in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

The surface layer of the soils in this unit is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Rangeland seeding of native plants or adapted grasses and legumes is a

suitable practice. The included alluvial soils produce a significant amount of the total forage on this unit.

Windbreak management.—The Cabba soil is poorly suited to windbreaks because of the very low to low available water capacity.

The Zahill soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, Rocky Mountain juniper, ponderosa pine, green ash, and blue spruce. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, and common chokecherry.

The Cambert soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, Rocky Mountain juniper, ponderosa pine, and blue spruce. Suitable shrubs are Siberian peashrub and common chokecherry.

The risk of soil blowing on this unit can be reduced by cultivating only between the rows of windbreaks.

Homesite development.—If this unit is used for homesite development, it is limited mainly by the restricted permeability of the underlying sedimentary beds in the Cabba and Cambert soils, the slow permeability and low strength of the Zahill soil, slope, frost action, and shrink-swell potential. Increasing the size of septic tank absorption fields helps to compensate for the restricted permeabilty of the underlying sedimentary beds in the Cabba and Cambert soils and the slow permeability of the Zahill soil. Steepness of slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Effluent from absorption fields can surface in downslope areas and create a nazard to health. Low soil strength, shrinking and swelling, and frost action can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IVe, nonirrigated. The Zahill and Cambert soils are in Silty range site, 10- to 14-inch precipitation zone, and the Cabba soil is in Shallow range site, 10- to 14-inch precipitation zone.

74—Zahill-Cabba-Cambert complex, 15 to 45 percent slopes. This map unit is on uplands, mainly in the eastern half of Roosevelt County and in most of Daniels County. Slope is 15 to 45 percent. Slopes are mainly 50 to 400 feet long. Elevation is 2,000 to 3,100 feet.

This unit is about 30 percent Zahill loam, 30 percent Cabba silt loam, and 30 percent Cambert silt loam. The Cabba soil is in the steeper areas of this unit, the Cambert soil is in the less sloping areas, and the Zahill soil is in the higher lying areas.

Included in this unit are small areas of Tally and Zahl soils; Zahill, Cabba, and Cambert soils that have slopes of less than 15 percent; and alluvial soils, in drainageways, that have a thicker and darker colored surface layer than does this Zahill soil. These areas do not adversely affect the use and management of this unit as rangeland. Also included are small areas of Rock outcrop. The areas of Rock outcrop support limited amounts of forage. Included areas make up about 10 percent of the total acreage.

The Zahill soil is deep and well drained. It formed in glacial till. Typically, the Zahill soil has a surface layer of grayish brown loam 3 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray and grayish brown clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 18 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

The Cabba soil is shallow, well drained, and droughty. It formed in material derived from weakly consolidated sedimentary beds. Typically, the surface layer is light brownish gray silt loam 5 inches thick. The underlying material to a depth of 18 inches is light brownish gray silt loam. Below this to a depth of 60 inches or more are weakly consolidated sedimentary beds. Weakly consolidated sedimentary beds are at a depth of 10 to 20 inches.

Permeability is moderate, and available water capacity is very low to low. Effective rooting depth is limited by the weakly consolidated sedimentary beds. Where this soil is under native vegetation, the average annual wetting depth is about 18 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

The Cambert soil is moderately deep, well drained, and droughty. It formed in material derived from weakly consolidated sedimentary beds. Typically, the surface layer is brown silt loam 4 inches thick. The subsoil is pale brown silt loam 20 inches thick. The substratum is pale yellow silt loam 6 inches thick. Below this to a depth of 60 inches or more are weakly consolidated sedimentary beds. Weakly consolidated sedimentary beds are at a depth of 20 to 36 inches.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is limited by the weakly consolidated sedimentary beds. Where this soil is under native vegetation, the average annual wetting depth is about 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

This unit is used as rangeland.

Crop management.—This unit is poorly suited to cultivated crops. It is limited mainly by slope.

Range management.—The potential plant community on the Zahill and Cambert soils is mainly western wheatgrass, green needlegrass, plains muhly, and little bluestem. If the range is excessively grazed, these grasses decrease and needleandthread, little

porcupinegrass, blue grama, junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as broom snakeweed, clubmoss, and weedlike forbs may invade.

The potential plant community on the Zahill soil produces about 900 pounds of air-dry vegetation per acre in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

The potential plant community on the Cambert soil produces about 800 pounds of air-dry vegetation per acre in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

The potential plant community on the Cabba soil is mainly little bluestem, sideoats grama, green needlegrass, and plains muhly. If the range is excessively grazed, these grasses decrease and needleandthread, blue grama, junegrass, Sandberg bluegrass, and fringed sagewort increase. If excessive grazing continues, plants such as broom snakeweed, annuals, and weedlike forbs may invade. The potential plant community will produce about 700 pounds of air-dry vegetation per acre in years of above-normal precipitation and 300 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas. Trails or walkways can be constructed to encourage livestock grazing in areas where access is limited. Mechanical treatment practices are not practical. The included alluvial soils produce a significant amount of the total forage on this unit.

Windbreak management.—This unit is poorly suited to windbreaks. It is limited mainly by steepness of slope.

Homesite development.—The main limitation of this unit for homesite development is steepness of slope.

This map unit is in capability subclass VIe, nonirrigated. The Zahill and Cambert soils are in Thin Hilly range site, 10- to 14-inch precipitation zone, and the Cabba soil is in Shallow range site, 10- to 14-inch precipitation zone.

75—Zahill-Tinsley complex, 8 to 15 percent slopes. This map unit is on uplands. It is throughout the survey area except in the southwestern part of Roosevelt County. Slope is 8 to 15 percent. Slopes are mainly 50 to 500 feet long. Elevation is 2,000 to 3,000 feet.

This unit is about 75 percent Zahill loam and 15 percent Tinsley very gravelly sandy loam.

Included in this unit are small areas of Farnuf, Zahl, and Tally soils and alluvial soils, in drainageways, that have a thicker and darker colored surface layer than does this Zahill soil. These areas do not adversely affect the use and management of this unit as rangeland and for nonirrigated cultivated crops. Also included are small areas of Wabek soils, Zahill soils that have a gravelly loam surface layer, and Zahill and Tinsley soils that have slopes of more than 15 percent. The Wabek soils are very droughty. Addition of barnyard manure helps to overcome this limitation. The areas of Zahill gravelly loam may interfere with tillage. The areas of Zahill and Tinsley soils that have slopes of more than 15 percent can be farmed around. Included areas make up about 10 percent of the total acreage.

The Zahill soil is deep and well drained. It formed in glacial till. Typically, the Zahill soil has a surface layer of grayish brown loam 5 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray and grayish brown clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is medium to rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

The Tinsley soil is deep, excessively drained, and very droughty. It formed in outwash. Typically, the Tinsley soil has a surface layer of brown very gravelly sandy loam 3 inches thick. The underlying material to a depth of 60 inches or more is pale brown very gravelly sand.

Permeability is rapid, and available water capacity is very low. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

Most areas of this unit are used as rangeland and for nonirrigated cultivated crops. A few areas are used as a source of sand and gravel. The main nonirrigated crops are spring wheat and barley.

Crop management.—This unit is poorly suited to nonirrigated cultivated crops. It is limited mainly by the hazards of water erosion and soil blowing on the Zahill soil and the droughtiness and poor tilth of the Tinsley soil. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. The amount of moisture in the soil can be increased by using tall grass barriers to minimize evaporation and trap snow. Return of crop residue helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces water erosion. Additions of barnyard manure improve the available water capacity. Crops respond to phosphate and nitrogen fertilizer.

Range management.—The potential plant community on the Zahill soil is mainly western wheatgrass, bluebunch wheatgrass, green needlegrass, and needleandthread. If the range is excessively grazed, western wheatgrass, bluebunch wheatgrass, and green needlegrass decrease and needleandthread, little porcupinegrass, blue grama, junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as cheatgrass, sixweeks fescue, clubmoss, and weedlike forbs may invade. The potential plant

community will produce about 1,300 pounds of air-dry vegetation per acre in years of above-normal precipitation and 600 pounds in years of below-normal precipitation.

The potential plant community on the Tinsley soil is mainly bluebunch wheatgrass, needleandthread, western wheatgrass, and plains muhly. If the range is excessively grazed, bluebunch wheatgrass, western wheatgrass, and plains muhly decrease and needleandthread, blue grama, perennial forbs, and fringed sagewort increase. If excessive grazing continues, plants such as broom snakeweed, clubmoss, and weedlike forbs may invade. The potential plant community will produce about 900 pounds of air-dry vegetation per acre in years of above-normal precipitation and 450 pounds in years of below-normal precipitation.

Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice. The included alluvial soils produce a significant amount of the total forage on this unit.

Windbreak management.—The Zahill soil is suited to windbreaks. Suitable trees for planting are Russian-olive, Siberian elm, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, lilac, and common chokecherry. The Tinsley soil is poorly suited to windbreaks because of the very low available water capacity.

Homesite development.—If the Zahill soil is used for homesite development, it is limited mainly by slope, low soil strength, slow permeability, and shrink-swell potential. If buildings are constructed on this soil, properly designed foundations and footings and diversions that take runoff away from buildings help prevent structural damage caused by the shrinking and swelling of the soil. If the soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

If the Tinsley soil is used for homesite development, it is limited mainly by slope, susceptibility to slumping, and the rapid permeability. The steepness of slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Effluent from absorption fields can surface in downslope areas and create a hazard to health. Because this soil is rapidly permeable, effluent from septic tank absorption fields can contaminate ground water. Cutbanks are not stable and are subject to slumping.

This map unit is in capability subclass IVe, nonirrigated. The Zahill soil is in Silty range site, 10- to 14-inch precipitation zone, and the Tinsley soil is in Gravel range site, 10- to 14-inch precipitation zone.

76—Zahill-Tinsley complex, 15 to 45 percent slopes. This map unit is on uplands. It is throughout the survey area except in the southwestern part of Roosevelt County. Slope is 15 to 45 percent. Slopes are mainly 50 to 400 feet long. Elevation is 2,000 to 3,000 feet.

This unit is about 75 percent Zahill loam and 15 percent Tinsley very gravelly sandy loam.

Included in this unit are small areas of Tally, Wabek, Zahl, and Cabba soils and alluvial soils, in drainageways, that have a thicker and darker colored surface layer than does this Zahill soil. Also included are small areas of Tinsley soils that have a loam, gravelly loam, or gravelly sandy loam surface layer. These included areas do not adversely affect the use and management of this unit as rangeland. Included areas make up about 10 percent of the total acreage.

The Zahill soil is deep and well drained. It formed in glacial till. Typically, the Zahill soil has a surface layer of grayish brown loam 3 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray and grayish brown clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 18 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. This soil is calcareous throughout.

The Tinsley soil is deep, excessively drained, and very droughty. It formed in outwash. Typically, the Tinsley soil has a surface layer of brown very gravelly sandy loam 3 inches thick. The underlying material to a depth of 60 inches or more is pale brown very gravelly sand.

Permeability is rapid, and available water capacity is very low. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is 60 inches or more. Runoff is slow to medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

Most areas of this unit are used as rangeland. A few areas are used as a source of sand and gravel.

Crop management.—This unit is poorly suited to cultivated crops. It is limited mainly by slope and ty the very low available water capacity of the Tinsley soil.

Range management.—The potential plant community on the Zahill soil is mainly western wheatgrass, green needlegrass, plains muhly, and bluebunch wheatgrass. If the range is excessively grazed, these plants decrease and needleandthread, little porcupinegrass, blue grama, junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as broom snakeweed, clubmoss, and weedlike forbs may invade. The potential plant community will produce about 900 pounds of air-dry vegetation per acre in years of above-normal precipitation and 400 pounds in years of below-normal precipitation.

The potential plant community on the Tinsley soil is mainly bluebunch wheatgrass, needleandthread, western wheatgrass, and plains muhly. If the range is excessively grazed, bluebunch wheatgrass, western wheatgrass, and plains muhly decrease and needleandthread, blue grama, perennial forbs, and fringed sagewort increase. If excessive grazing continues, plants such as broom snakeweed, clubmoss, and weedlike forbs may invade. The potential plant community will produce about 750 pounds of air-dry vegetation per acre in years of above-normal precipitation and 350 pounds in years of below-normal precipitation.

Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas. Trails or walkways can be constructed to encourage livestock grazing in areas where access is limited. Mechanical treatment practices are not practical. The included alluvial soils produce a significant amount of the total forage on this unit.

Windbreak management.—This unit is poorly suited to windbreaks because of slope and the very low available water capacity of the Tinsley soil.

Homesite development.—The main limitation of this unit for homesite development is steepness of slope.

This map unit is in capability subclass VIe, nonirrigated. The Zahill soil is in Thin Hilly range site, 10- to 14-inch precipitation zone, and the Tinsley soil is in Gravel range site, 10- to 14-inch precipitation zone.

77—Zahl loam, 2 to 8 percent slopes. This deep, well drained, undulating to gently rolling soil is on uplands. It is mainly in the eastern one-fourth of Roosevelt County. It formed in glacial till. Slope is 2 to 8 percent. Slopes are mainly 50 to 250 feet long. Elevation is 2,000 to 2,800 feet.

Included in this unit are small areas of Zahill, Dooley, and Dimmick soils and Zahl soils that have a sandy loam surface layer. Also included are small areas of Zahl soils that have a high content of lime in the underlying material or have stones and boulders on 1 to 3 percent of the surface. The Zahill and Dooley soils and the Zahl soils that have a sandy loam surface layer are subject to a higher hazard of soil blowing than is this Zahl soil. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. The Dimmick soils are in undrained depressional areas. They can be farmed around. The Zahl soils that have stones and boulders on 1 to 3 percent of the surface interfere with tillage. The Zahl soils that have a high content of lime in the underlying material do not adversely affect the use and management of this unit as rangeland.

Typically, the Zahl soil has a surface layer of dark grayish brown loam 7 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 28 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This soil is used mainly as rangeland. It is also used for nonirrigated cultivated crops and grass-legume hay. The main nonirrigated crop is spring wheat.

Crop management.—If this soil is used for nonirrigated cultivated crops, it is limited by the hazards of water erosion and soil blowing. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. The amount of moisture in the soil can be increased by using tall grass barriers to minimize evaporation and trap snow. Return of crop residue helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces water erosion.

Range management.—The potential plant community is mainly western wheatgrass, green needlegrass, little bluestem, and needleandthread. If the range is excessively grazed, western wheatgrass, green needlegrass, and little bluestem decrease and needleandthread, little porcupinegrass, blue grama, junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as cheatgrass, sixweeks fescue, clubmoss, and weedlike forbs may invade. The potential plant community will produce about 1,600 pounds of air-dry vegetation per acre in years of above-normal precipitation and 1,000 pounds in years of below-normal precipitation. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Siberian elm, green ash, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and common chokecherry.

Homesite development.—If this soil is used for homesite development, it is limited mainly by the slow permeability, low soil strength, and shrink-swell potential. If buildings are constructed on this soil, properly design foundations and footings and divert runoff away from buildings to help prevent structural damage as a result of shrinking and swelling. If the soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IIIe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

78—Zahl loam, 8 to 15 percent slopes. This deep, well drained soil is on uplands. It is mainly in the eastern one-fourth of Roosevelt County and in the eastern one-half of Daniels County. It formed in glacial till. Slope is 8 to 15 percent. Slopes are mainly 50 to 500 feet long. Elevation is 2,000 to 2,800 feet.

Included in this unit are small areas of Zahill, Dooley, and Dimmick soils. Also included are small areas of Zahl soils that have a high content of lime in the underlying material or have stones and boulders on 1 to 3 percent of the surface. The Zahill and Dooley soils are subject to a higher hazard of soil blowing than is the Zahl soil. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage reduce soil blowing. The Dimmick soils are in undrained depressional areas. They can be farmed around. The Zahl soils that have stones and boulders on 1 to 3 percent of the surface interfere with tillage. The Zahl soils that have a high content of lime in the underlying material do not adversely affect the use and management of this unit as rangeland.

Typically, the Zahl soil has a surface layer of dark grayish brown loam 6 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Where this soil is under native vegetation, the average annual wetting depth is about 24 inches. Runoff is medium to rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This soil is used mainly as rangeland. It is also used for grass-legume hay.

Crop management.—This soil is poorly suited to nonirrigated cultivated crops. It is limited mainly by the hazards of water erosion and soil blowing. All tillage should be on the contour or across the slope. Keeping tillage at a minimum maintains tilth, increases the water intake rate, and reduces the risk of erosion. Minimum tillage, contour cultivation, stripcropping, tall grass barriers, grassed waterways, and return of crop residue to the soil reduce soil blowing and water erosion. The amount of moisture in the soil can be increased by using tall grass barriers to minimize evaporation and trap snow. Return of crop residue helps to maintain good soil tilth. Chiseling stubble fields in fall on the contour or across the slope reduces water erosion.

Range management.—The potential plant community is mainly western wheatgrass, green needlegrass, little bluestem, and needleandthread. If the range is excessively grazed, western wheatgrass, green needlegrass, and little bluestem decrease and needleandthread, little porcupinegrass, blue grama, junegrass, and threadleaf sedge increase. If excessive grazing continues, plants such as cheatgrass, sixweeks fescue, clubmoss, and weedlike forbs may invade. The potential plant community will produce about 1,400 pounds of air-dry vegetation per acre in years of above-normal precipitation and 700 pounds in years of below-normal precipitation.

The surface layer is susceptible to water erosion and soil blowing if it is disturbed or the range is overgrazed. Proper grazing use insures good plant vigor and adequate plant cover. Where clubmoss and blue grama are the dominant vegetation, practices such as pitting, furrowing, or chiseling can be used to improve areas of depleted rangeland. Such practices increase the water intake rate, reduce plant competition, and allow the more desirable native plants to increase. Rangeland seeding of native plants or adapted grasses and legumes is a suitable practice.

Windbreak management.—This soil is suited to windbreaks. Suitable trees for planting are Siberian elm, green ash, and Rocky Mountain juniper. Suitable shrubs are Siberian peashrub, Tatarian honeysuckle, and common chokecherry.

Homesite development.—If this soil is used for homesite development, it is limited mainly by slope, the slow permeability, low soil strength, and shrink-swell potential. If buildings are constructed on this soil, properly design foundations and footings and divert runoff away from buildings to help prevent structural damage as a result of shrinking and swelling. If the soil is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field. The steepness of slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Effluent from absorption fields can surface in downslope areas and create a hazard to health. Shrinking and swelling and low soil strength can adversely affect the quality of roadbeds and road surfaces. Providing adequate drainage and using suitable fill material that is properly compacted can overcome these limitations.

This map unit is in capability subclass IVe, nonirrigated. It is in Silty range site, 10- to 14-inch precipitation zone.

Prime Farmland

Prime farmland is one of several kinds of important farmlands defined by the U.S. Department of Agriculture. It is of major importance in meeting the nation's short- and long-range needs for food and fiber. The supply of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, must encourage and facilitate the use of our nation's prime farmland with wisdom and foresight.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to economically produce a sustained high yield of crops when it is treated and managed, using acceptable farming methods. Prime farmland produces the highest yields with minimal inputs of energy and economic resources and causes the least damage to the environment.

Prime farmland may now be in cultivated crops, rangeland, woodland, or other uses. It does not include urban and built-up areas or water areas. To qualify as prime farmland, it must be used for producing either food or fiber or be available for these uses.

In this survey area, prime farmland has an adequate and dependable supply of water for irrigation. Temperature and length of growing season are favorable, and levels of acidity or alkalinity are acceptable. Few, if any, rock fragments exist and the soils are permeable to water and air. Prime farmland is not excessively erodible, is not saturated with water for long periods, and is not frequently flooded. The slope ranges from 0 to 4 percent. For more detailed information on the criteria for prime farmland, consult the local office of the Soil Conservation Service.

About 6,000 acres of this survey area consists of soils that are irrigated and that meet all the requirements for prime farmland. Approximately one-half of this, or 3,000 acres, consists of protected Havre and Glendive soils. These soils are southwest of the city of Wolf Point, on the Missouri River flood plain. They are in general soil map unit 3. They are used mainly for alfalfa hay and spring wheat. The remaining 3,000 acres is made up of soils mostly scattered along the flood plains of the Poplar and Missouri Rivers. These soils are mainly in general map units 1 and 2. They are used mainly for alfalfa hay, spring wheat, barley, and corn for silage.

About 119,000 acres of this survey area consists of soils that would meet the requirements for prime farmland if irrigated. These soils are mainly in general map units 1, 2, 3, and 12.

The detailed map units in this survey area that meet the requirements for prime farmland if irrigated are listed in this section. This list does not constitute a recommendation for a particular land use. The extent of each map unit listed is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described in the section "Detailed Soil Map Units."

7 Bowbells silt loams, 0 to 4 percent slopes
22 Grail silty clay loam, 0 to 4 percent slopes
23 Harlem silty clay loam, protected, 0 to 2 percent slopes
24 Havre silt loam, protected, 0 to 2 percent slopes
25 Havre-Glendive complex, protected, 0 to 2 percent slopes
26 Havrelon loam, 0 to 2 percent slopes
27 Havrelon silt loam, protected, 0 to 2 percent slopes
28 Havrelon-Trembles complex, 0 to 2 percent slopes
29 Havrelon-Trembles complex, protected, 0 to 2 percent slopes
68 Williams loam, 0 to 2 percent slopes

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and to the environment. Also, it can help prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where slope, bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops

General management needed for crops is suggested in this section. The crops best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

About 51 percent of the survey area is used for cultivated crops. About 1,250,000 acres is used for nonirrigated crops, and about 20,000 acres, mainly along the Missouri and Poplar Rivers, is used for irrigated crops.

Spring wheat is the principal nonirrigated crop, but winter wheat, barley, alfalfa hay, grass-legume hay, and grass hay are also important.

The main concerns in managing nonirrigated cropland in this survey area are conserving moisture, controlling soil blowing and water erosion, and maintaining soil fertility.

Conserving moisture generally consists of reducing evaporation, limiting runoff, increasing the water intake rate, and controlling weeds. Among the effective means of conserving moisture are use of stubble mulching, contour farming, stripcropping, field windbreaks, timely tillage, minimum tillage, and crop residue. Fallow helps to control weeds and thus conserves moisture.

Soil blowing and water erosion are reduced by use of stubble mulch tillage, stripcropping, field windbreaks, tall grass barriers (fig. 3), contour cultivation, minimum tillage, timely tillage, terraces, crop residue, diversions, and grassed waterways. Generally, a combination of several practices is used.

Among the practices that help to maintain fertility are applying chemical fertilizer and barnyard manure and using green manure crops. Controlling erosion also helps to maintain fertility. All of the soils in this survey area that are used for nonirrigated crops respond to fertilizer.

Drainage, removal of stones, and reduction of salinity are needed in places to offset the effects of unfavorable soil characteristics. Weed control, fertilization, stubble management, wind barriers, shelterbelts, proper tillage practices, and erosion control measures also need to be considered.

Wet salty areas, or saline seeps, are a problem on terraces, fans, and foot slopes in areas of nonirrigated cropland, hayland, and rangeland. These saline seeps are caused primarily by water moving below the root zone during periods of high precipitation or during the summer fallow period in a crop-fallow system. Intermittent ponding of water on the surface also

Figure 3.—Tall grass barriers on Williams loam, 2 to 8 percent slopes, help to control soil blowing and increase soil moisture by trapping snow.

contributes to deep percolation. In all cases, the water moves through the substratum and dissolves salts as it moves downslope, where it resurfaces to form saline seeps. For farmers and landowners, seeps cause severe economic losses and are nonproductive. They commonly are too wet to farm across and are inconvenient and time consuming to farm around. Once formed, saline seeps may increase in size at the rate of 5 to 10 percent per year. In areas of rangeland, the seeps commonly are below dams or are downslope from cropland.

The best solution to the saline seep problem on nonirrigated cropland is to use the water where it falls by cropping more intensively. This requires using annual or flexible cropping systems or seeding legumes or grasses. Annual cropping with adequate fertilization prevents the development of saline seeps in some fields.

Where saline seeps are already present and increasing in size, use of deep-rooted legumes and grasses probably will be necessary to halt the process and initiate reclamation.

Alfalfa hay is the principal irrigated crop. Grass-legume hay, spring wheat, and corn for silage are other important irrigated crops.

In managing irrigated cropland in this survey area, land leveling, ditch lining, erosion control structures, good quality water for irrigation, and timely application of irrigation water are needed.

In recent years there has been increased interest in growing sunflower, safflower, and flax. Presently, a limited amount of acreage is planted to these crops. In 1979, production was 1,000 pounds of sunflower seed per acre on 600 acres, 950 pounds of safflower seed per acre on 8,000 acres, and 15 bushels of flax per acre on 1,000 acres.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. Yields shown for small grain are for a crop-fallow cropping system.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops (*3*). Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the section "Detailed Soil Map Units."

Rangeland

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Rangeland produces a native plant community of mainly grasses, forbs, and shrubs. It is primarily used for grazing of domestic livestock; however, it has other uses such as wildlife habitat, recreation, watershed, and esthetic value.

In this survey area, about 49 percent of the land, or slightly over 1,200,000 acres, is managed as rangeland. Rangeland is the second largest single resource in the area, providing forage for nearly 71,000 head of cattle in 1976. The sale of livestock and livestock products accounts for about one-half of the farm and ranch income. Cattle is the major kind of livestock, and cow-calf operations are dominant. Some operators hold calves for sale as yearlings.

The first cattle in the survey area were Texas longhorns. These cattle were brought to the area in about 1882. Nearly all the land in the county was used for grazing at that time. During 1900 to 1914, homesteaders started to move in, and they began to plow the areas of rangeland; however, the droughts from 1917 to 1923 and in the 1930's forced many to abandon their homes, leaving the land to recover by itself. This plowing and subsequent abandonment, along with indiscriminate overgrazing of the rangeland, led to a severe deterioration of this irreplaceable resource. Since the 1950's, however, most of the rangeland in the survey area has been gradually improving. At present, about 60 percent is in good or excellent condition, compared with about 50 percent in 1970. This improvement is largely because of improved rangeland management.

General information on range sites, range condition, and rangeland management is given in this section.

Range Sites

There are many different soils in the survey area. For this reason there are several different kinds of rangeland, or range sites (fig. 4). Over a period of time, the combination of plants best adapted to a particular soil and climate has developed. If the soil is not excessively disturbed, this group of plants is the potential, or climax, plant community for the site. Climax plant communities are not static; they vary slightly from year to year and from place to place. Each range site differs from other range sites in the kind, amount, and proportion of native plants.

Working together, range conservationists and soil scientists group soils into appropriate range sites. Thus, range sites generally can be determined from the detailed soil maps.

Soil properties that affect moisture supply and plant nutrients have the most influence on range production. Soil reaction, salt content, and a seasonal high water table are also important in determining the kinds of plants that grow in a particular location. For example, bluebunch wheatgrass grows mainly on range sites in the western half of Roosevelt County and most of Daniels County. It is not common on sites in the eastern part of Roosevelt County. Little bluestem and sideoats grama do not commonly grow on range sites in the western part of Roosevelt County.

Range Condition

Abnormal disturbance such as repeated overuse by livestock or excessive burning, erosion, or plowing changes the climax plant community. Grazing animals select the most palatable plants; therefore, these plants will eventually die if continually grazed. If the disturbance is severe enough, the climax community can be completely destroyed and less desirable plants such as annuals and weedlike plants may invade. If the plant community has not deteriorated significantly, it eventually will return to dominantly climax plants.

Four range condition classes are used to show the degree of deterioration of the climax plant community. An area of rangeland is in excellent condition if more than 75 percent of the present plant community is the same as in the climax plant community. It is in good condition if the percentage of climax plants is 51 to 75; fair, if the percentage is 26 to 50; and poor, if the percentage is less than 25.

Knowledge of the range site and condition is necessary as a basis for planning and applying needed management to improve or maintain the desired plant community for selected uses. Such information is needed to determine management objectives, proper grazing systems and stocking rates, suitable wildlife management practices, recreation potential, and the condition of watersheds.

Rangeland Management

Any management of rangeland should provide for a plant cover that will adequately protect or improve the soil and water resources and will meet the needs of the operator. This usually involves restoring the plant community to near climax condition. Sometimes, however, a plant cover somewhat below potential better meets specific grazing or wildlife habitat needs and also protects the resource.

Grazing management is the most important part of any rangeland management program. Proper grazing, deferred grazing, and planned rotation grazing are key practices. Experience and research of ranchers have shown that if about one-half the current year's growth of range plants is grazed, a plant community in good or excellent condition can be maintained and one in fair condition can be improved. The remaining plants provide food for regrowth, root development, and storage for future growth. This makes the desirable plants more healthy and helps to keep them from being replaced by less desirable plants and weeds. It also protects the soil from erosion by wind or water and acts as a mulch. A mulch improves soil tilth, improves the water intake rate, and reduces runoff.

Figure 4.—The Clayey range site of the Phillips soils, in the foreground, produces more forage than the Dense Clay range site of the Elloam soils, in the background.

Certain practices commonly are needed to control livestock and maintain uniform grazing. These include water developments, fencing, properly locating salt and mineral supplements, constructing stock trails in rougher areas, and riding or herding. These practices usually are essential for achieving a good rangeland management program.

Special improvement practices are needed in places where management practices do not achieve the desired results or where recovery is too slow from forage management alone. These practices include range seeding, brush control, water spreading, prescribed burning, and mechanical treatment.

Where feasible, mechanical renovation practices such as shallow chiseling and scalping can help speed recovery. These practices open up the soil surface to allow more moisture to be absorbed, and they reduce the amount of the less desirable plants in the area.

Mechanical renovation practices and brush control must be followed by resting or deferred grazing of the rangeland for at least the first two growing seasons to allow better recovery of the desired plants. Proper grazing management should then be applied.

An area that has few if any desirable plants may need to be seeded. A clean, firm seedbed should be prepared and seeded to adapted native plants. The area should then be rested the first two growing seasons to allow the new plants to become established.

Proper management results in rangeland that adequately supports livestock and wildlife. Well-managed native grazing land also adds to the natural beauty of the area and the maintenance of a high-quality environment.

Woodland Management and Productivity

About 9,000 acres of the survey area is forested. All the forested areas are productive enough to be considered commercial forest land. The forests are on alluvial soils along the Missouri River. The most common tree species is plains cottonwood. Box elder and green ash, which are native to the area, commonly are among the understory plants. Russian-olive, an introduced species, is also becoming a common understory component of cottonwood stands.

Stands of cottonwood commonly are on Glendive, Havre, Havrelon, Lohler, and Trembles soils. The cottonwood has been removed from some areas of these soils, and the areas are used as cropland and pastureland.

Most of the forest land in the survey area is grazed. Forests along the Missouri River provide effective protection and feeding areas for livestock in winter.

A small amount of the cottonwood trees are harvested for firewood. Little additional use is being made of the wood. Cottonwood has value as chips for paper, decking, crating, and framing for upholstered furniture.

Reestablishment of cottonwood from seed is highly dependent upon the presence of a moist mineral soil seedbed, which often is left after a flood. Cottonwood can also regenerate from root or stump sprouts; however, as cottonwood trees age, their ability to sprout decreases. With the construction of Fort Peck Dam, flooding has been reduced; consequently, areas suitable for the regeneration of cottonwood from seed have been reduced.

Control of the water level in the Missouri River below Fort Peck Dam may also have reduced the productivity of the stands of cottonwood. The rate of diameter growth has been reduced since construction of the reservoir.

In future years the planting of cottonwood seedlings may become necessary to maintain stands. Green ash regenerates successfully from seed in areas that are ponded periodically. Russian-olive has become established from seed beneath the cottonwood, and thus in many areas it may replace the cottonwood. In terms of wood production for commercial use, cottonwood is the most desirable.

Woodland management information for each forested soil is in the section "Detailed Soil Map Units." If a particular limitation is not discussed in the map unit description, the limitation is not significant to use and management of the unit for timber production. The following is a list of the map units that support forest.

21 Glendive fine sandy loam, protected, 0 to 2 percent slopes
24 Havre silt loam, protected, 0 to 2 percent slopes
25 Havre-Glendive complex, protected, 0 to 2 percent slopes
27 Havrelon silt loam, protected, 0 to 2 percent slopes
29 Havrelon-Trembles complex, protected, 0 to 2 percent slopes
37 Lohler silty clay, protected, 0 to 2 percent slopes
55 Trembles fine sandy loam, protected, 0 to 2 percent slopes

The following paragraphs give definitions and explanations of some of the terms used in the map unit discussions of woodland management.

Potential productivity is the estimated yield of each forest species that a given soil can produce under a given level of management. It is expressed as a site index. This index is the average height, in feet, that the dominant and codominant trees of a given species attain in a specified number of years. For cottonwood the specified number is 30 years. Site index values can be related to yield tables to determine the potential yield of wood products per acre in board feet or cubic feet. The species for which yield and site index calculations were made in each map unit generally are the most common ones on the unit and the most desirable to manage for timber production.

The *site index* values for plains cottonwood were determined by adjusting site index curves for eastern cottonwood. Gross board foot volumes per acre were determined by measurements taken from the ground during the soil survey. Logs that were 8 feet long and 8 inches in diameter or more at the top were measured in determining board foot volumes. Cubic volume per acre was determined by applying a conversion factor of 5.2 board feet per cubic foot. Cubic volume includes the entire tree, excluding the bark and twigs. Average annual yields at the culmination of mean annual increment were computed from the above information and are in the section "Detailed Soil Map Units."

Culmination of mean annual increment is the point in time at which average annual yield reaches the maximum.

Ratings of *hazard of erosion* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitations* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Ratings of seedling mortality indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that few trees may be blown down by strong winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

Ratings of *plant competition* indicate the degree to which undesirable plants are expected to invade where there are openings in the tree canopy. The invading plants compete with native plants or planted seedlings. A rating of *slight* indicates little or no competition from other plants; *moderate* indicates that plant competition is expected to hinder the development of a fully stocked stand of desirable trees; and *severe* indicates that plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed to control undesirable plants.

Species suitability refers to tree species that are adapted to the soil being rated and are desirable to plant or manage for timber production.

Silvicultural system refers to methods of harvesting trees that provide for the regeneration of desirable tree species, develop a desirable stand structure, and aid in insect and disease control. The application of a particular silvicultural system is determined by the kinds of trees a given soil supports, management objectives, and the condition of the stand.

The *selection silvicultural system involves the removal of mature and immature trees either singly or in groups at specific intervals (4)*. Regeneration is established almost continuously, and an uneven-aged stand is maintained. This system favors the regeneration of the more tolerant of associated trees.

The *shelterwood silvicultural system* involves removing the stand in a series of cuts. Regeneration occurs under a partial forest canopy. After regeneration is established, a final cut removes the shelterwood and permits the stand to develop in the open as an even-aged stand. This system is well adapted to sites where shelter is needed for new reproduction, and it favors regeneration of the less tolerant species in a forest stand.

Windbreaks

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Windbreaks are discussed in the map unit descriptions in the section "Detailed Soil Map Units." Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

Recreation

The soils of the survey area are rated in table 6 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 6, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 6 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 8 and interpretations for dwellings without basements and for local roads and streets in table 7.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary

facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Wildlife Habitat

Ronald F. Batchelor, biologist, Soil Conservation Service, helped to prepare this section.

The abundance of a wildlife species is directly related to the extent and diversity of its habitat. The relationship of wildlife to soils is more aptly expressed as a soil-vegetation-wildlife relationship. Species of wildlife are more readily associated with the plant communities that make up their habitat than with specific soils. Productive, well-managed soils generally support or have the potential to support vigorous wildlife populations, while infertile, poorly managed soils usually support sparse populations. Together, plants and animals constitute natural communities that are governed by many environmental influences, of which soil is but a part.

The quality and interspersion of habitat determine wildlife population levels. The suitability of a given habitat for a wildlife species depends greatly on the nature of plant communities present, while the quantity, quality, and distribution of a particular habitat is determined by prevailing land use practices and management. These factors are governed to some extent by the soils of the area.

Rating soils for their ability to produce vegetative elements for wildlife habitat does not take into account climatic influences, present use of soils, juxtaposition of habitat types or elements, or present distribution of wildlife species. For these reasons, the selection and suitability of an area for wildlife habitat development requires onsite evaluation.

Grassland, nonirrigated and irrigated cropland, riparian woodland, streams and rivers, ponds, marshes, and reservoirs provide a variety of habitats for the wildlife in the survey area.

Irrigated and nonirrigated farming made possible the introduction of the ring-necked pheasant, particularly on the bottom lands of the Missouri River and its major tributaries, the Poplar River and Big Muddy Creek. The success of this introduction was a result of varied land use patterns that include small grain, irrigated crops, annual weeds, and brushy cover; however, pheasant populations in the survey area are limited by the very farming practices that fostered them. In recent years, more intensive farming, resulting in the loss of brushy fence rows and densely vegetated ditchbanks and in fewer idle areas, has coincided with a decline in the number of pheasants.

Land management practices beneficial to pheasants include proper grazing, protection of woody cover from burning or eradication, retention of stubble and waste grain during winter through elimination of fall tillage, and use of woody plantings in the form of shelterbelts and hedgerows.

General map units 2 and 3 include the major part of the Missouri River bottom lands that support habitat for ringnecks in the form of irrigated and nonirrigated cropland, brushy ditchbanks, and fence rows. Units 10, 12, and 13 provide good upland habitat in the form of grainfields, shelterbelts, and brush along drainageways.

Hungarian partridge, an introduced species from Europe, is associated with cropland and grassland in the survey area. Populations of Hungarian partridge, like sharp-tailed grouse, fluctuate apparently as a result of changes in available habitat, variability in the weather, and diseases. These birds often congregate around shelterbelts and farmsteads for food and cover, especially during winter.

Sharp-tailed grouse are throughout much of the prairie uplands of the survey area. The grainfields, brushy cover, and fruit-bearing shrubs such as chokecherry, plum, rose, snowberry, and buffaloberry provide excellent habitat on these uplands.

Land management practices of benefit to Hungarian partridge and sharp-tailed grouse include proper grazing to maintain sufficient vegetation for nesting, roosting, and rearing of young and to protect woody vegetation in draws and along fence rows.

All the general map units support plant communities that can provide habitat for sharp-tailed grouse and Hungarian partridge. Within these units, grainfields, shelterbelts, windbreaks, brushy draws, and a mixture of trees, shrubs, and grasses provide suitable habitat for these prairie species.

Sage grouse are throughout the areas of rangeland west of the Poplar River. Optimum sage grouse habitat is characterized by plant communities of sagebrush with a variety of forbs and grasses.

Both white-tailed deer and mule deer are in the survey area. White-tailed deer generally are along the flood plain of the Missouri River and in scattered bands throughout the northern part of Daniels County. Mule deer are in many areas on uplands and brushy bottoms and in some areas of rangeland. The largest population of mule deer is in the southeastern part of Roosevelt County, adjacent to the Missouri and Poplar Rivers. Units 1, 2, 3, and 4 provide much of the habitat for white-tailed deer, and units 6 and 8 provide the best habitat for mule deer.

Pronghorn antelope are mainly on the prairies in the northwestern corner of Daniels County. A few scattered bands are in Roosevelt County east of Big Muddy Creek, primarily in units 12 and 14. The potential for maintaining pronghorn antelope herds is dependent on the proper management of rangeland.

The Missouri and Poplar Rivers, their tributaries, and the many marshes, ponds, and reservoirs throughout the survey area provide habitat for an abundance of waterfowl during spring and fall migrations. Migratory birds use riverine habitat for nesting, feeding, and loafing. Substantial populations of Canada geese use the Missouri River throughout the year. Geese nest on the larger islands and use sparsely vegetated sandbars as loafing and feeding areas. Cropland adjacent to rivers and streams provides important feeding areas for migratory waterfowl.

Beaver, mink, muskrat, and raccoon are throughout the principal watercourses. Cottontail rabbits, badgers, ground squirrels, coyotes, and a variety of small mammals are throughout the survey area.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 7 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the

limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock or a very firm dense layer, stone content, soil texture, and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 8 shows the degree and the kind of soil limitations that affect tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 8 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 60 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock, and flooding affect absorption of the effluent. Large stones and bedrock interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 8 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock, flooding, large stones, and content of organic matter.

Excessive seepage because of rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope and bedrock can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 8 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 5 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 9 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of about 5 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* have one or more of the following characteristics. They are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have one or more of the following characteristics. They have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 9, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 10 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 10 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock or to other layers that affect the rate of water movement, permeability, depth to a high water table or depth of standing water if the soil is subject to ponding, slope, susceptibility to flooding, subsidence of organic layers, and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to

bedrock, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 11 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*6*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points)

across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 12 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate or high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, very fine sand, sand, and organic matter (up to 4 percent) and on soil structure and permeability. The estimates are modified by the presence of rock fragments. Values of K range from 0.02 to 0.64. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the amount of stable aggregates 0.84 millimeters in size. These are represented idealistically by USDA textural classes. Soils containing rock fragments can occur in any group.

1. Sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are moderately erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 12, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 13 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 13 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs, on the average, no more than once in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; April-June, for example, means that flooding can occur during the period April through June.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a

seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 13 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 13.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An *artesian* water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*5*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 14 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Boroll (*Bor*, meaning cool, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Argiborolls (*Arg*, meaning an argillic horizon is present, plus *boroll*, the suborder of the Mollisols that have a frigid temperature regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Argiborolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed Typic Argiborolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (*2*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*5*). Unless otherwise stated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Adger Series

The Adger series consists of deep, well drained soils on fans and foot slopes. These soils formed in alluvium. Slopes range from 1 to 8 percent.

These soils are fine, montmorillonitic Leptic Natriborolls.

Typical pedon of an Adger silty clay loam, in an area of Adger-Nobe complex, 1 to 4 percent slopes, 2,000 feet north and 300 feet west of the southeast corner of sec. 17, T. 28 N., R. 55 E.

A1—0 to 1 inch; grayish brown (2.5Y 5/2) loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium granular structure; slightly hard, friable,

slightly sticky and slightly plastic; many fine and medium roots; noneffervescent; mildly alkaline; abrupt smooth boundary.

B2t—1 inch to 8 inches; grayish brown (2.5Y 5/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; moderate coarse prismatic structure parting to strong medium angular blocky; slightly hard, friable, sticky and very plastic; few fine roots throughout; many clay films in root channels, in pores, and on faces of peds; few fine salt crystals; violently effervescent; moderately alkaline; clear smooth boundary.

C1cssa—8 to 28 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, very sticky and very plastic; few roots; many soft fine and medium salt crystals and few soft fine gypsum crystals; violently effervescent; moderately alkaline; clear smooth boundary.

C2cssa—28 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, very sticky and very plastic; few roots; few soft fine and medium salt crystals and few soft fine gypsum crystals; violently effervescent; strongly alkaline.

The A horizon is 0.5 inch to 2 inches thick. The mollic epipedon is 7 to 14 inches thick. The Bt horizon is silty clay or clay. The C horizon has few to many crystals of gypsum and other salts. It is dominantly silty clay or clay, but some pedons have thin strata as coarse textured as fine sandy loam. The Bt and C horizons are 15 to 30 percent exchangeable sodium.

Banks Series

The Banks series consists of deep, somewhat excessively drained soils on flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

These soils are sandy, mixed, frigid Typic Ustifluvents.

Typical pedon of Banks loam, 0 to 2 percent slopes, 800 feet south and 600 feet west of the northeast corner of sec. 5, T. 28 N., R. 51 E.

A1—0 to 12 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; many fine and medium roots; common fine tubular pores; slightly effervescent in lower part; mildly alkaline; abrupt smooth boundary.

C1ca—12 to 20 inches; light brownish gray (2.5Y 6/2) loamy fine sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose, nonsticky and nonplastic; many fine roots and common medium roots; few fine tubular pores; violently effervescent; moderately alkaline; abrupt smooth boundary.

IIC2—20 to 40 inches; light yellowish brown (2.5Y 6/3) fine sand that has few thin strata of fine sandy loam, olive brown (2.5Y 4/3) moist; single grain; loose, nonsticky and nonplastic; few fine roots; strongly effervescent; mildly alkaline; abrupt smooth boundary.

IIC3—40 to 54 inches; light yellowish brown (2.5Y 6/3) sand, olive brown (2.5Y 4/3) moist; single grain; loose, nonsticky and nonplastic; strongly effervescent; mildly alkaline; clear smooth boundary.

IIIC4—54 to 60 inches; light yellowish brown (2.5Y 6/3) sand, olive brown (2.5Y 4/3) moist; single grain; loose, nonsticky and nonplastic; 2 percent pebbles; strongly effervescent; moderately alkaline.

The 10- to 40-inch control section is loamy fine sand, loamy sand, or sand that has thin strata of fine sandy loam, silt loam, or loam.

Beaverton Series

The Beaverton series consists of deep, well drained soils on terraces. These soils formed in outwash material. Slopes range from 2 to 15 percent.

These soils are loamy-skeletal, mixed Typic Argiborolls.

Typical pedon of a Beaverton very cobbly sandy loam in an area of Turner-Beaverton complex, 8 to 15 percent slopes, 1,320 feet east and 1,980 feet north of the southwest corner of sec. 6, T. 30 N., R. 47 E.

Ap—0 to 4 inches; brown (7.5YR 4/2) very cobbly sandy loam, dark brown (7.5YR 3/2) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic; many fine roots; 20 percent pebbles and 15 percent cobbles; noneffervescent; slightly acid; clear smooth boundary.

B2t—4 to 15 inches; brown (7.5YR 4/4) very cobbly sandy clay loam, brown (7.5YR 4/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; many fine roots; common fine tubular pores; common clay films on faces of peds, in root channels, in pores, and as bridges between sand grains; 25 percent pebbles and 20 percent cobbles; noneffervescent; mildly alkaline; clear smooth boundary.

B3—15 to 24 inches; yellowish brown (10YR 5/4) very cobbly sandy clay loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; hard, firm, sticky and plastic; common fine and medium roots throughout; many fine tubular pores; 30 percent pebbles and 20 percent cobbles; noneffervescent; mildly alkaline; gradual smooth boundary.

IIC1ca—24 to 60 inches; brown (10YR 4/3) very cobbly loamy sand, brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; few fine and

medium roots; 30 percent pebbles and 20 percent cobbles; few lime coatings on undersides of pebbles; strongly effervescent; mildly alkaline.

The mollic epipedon is 7 to 14 inches thick and includes all or part of the argillic horizon. The A horizon is slightly acid to mildly alkaline. The profile is 35 to 50 percent coarse fragments.

The Beaverton soils in this survey area are a taxadjunct to the Beaverton series because they are moderately deep to very cobbly loamy sand.

Blanchard Series

The Blanchard series consists of deep, excessively drained soils on rolling dunes on uplands. These soils formed in eolian sand. Slopes range from 4 to 25 percent.

These soils are mixed, frigid Typic Ustipsamments.

Typical pedon of Blanchard loamy fine sand, 4 to 25 percent slopes, 1,650 feet east and 50 feet north of the southwest corner of sec. 8, T. 29 N., R. 55 E.

A1—0 to 4 inches; brown (10YR 5/3) loamy fine sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose, nonsticky and nonplastic; common fine and medium roots; noneffervescent; medium acid; clear smooth boundary.

C1—4 to 24 inches; light olive brown (2.5Y 5/4) loamy sand, olive brown (2.5Y 4/4) moist; single grain; loose, nonsticky and nonplastic; common fine and medium roots; noneffervescent; neutral; gradual smooth boundary.

C2—24 to 60 inches; light yellowish brown (2.5Y 6/4) fine sand, olive brown (2.5Y 4/4) moist; single grain; loose, nonsticky and nonplastic; few fine roots; noneffervescent; neutral.

The A horizon is medium acid to mildly alkaline. The C horizon is sand to loamy fine sand. Depth to calcareous material is 30 inches to more than 60 inches.

Bowbells Series

The Bowbells series consists of deep, moderately well drained and well drained soils in depressional areas on glacial till uplands. These soils formed in glacial till and local alluvium. Slopes range from 0 to 4 percent.

These soils are fine-loamy, mixed Pachic Argiborolls.

Typical pedon of a Bowbells silt loam in an area of Bowbells silt loams, 0 to 4 percent slopes, 2,100 feet west and 200 feet south of the northeast corner of sec. 4, T. 34 N., R. 51 E.

Ap—0 to 5 inches; dark grayish brown (2.5Y 4/2) silt loam, very dark gray (10YR 3/1) moist; moderate very fine granular structure; soft, very friable, slightly sticky and nonplastic; 5 percent pebbles; noneffervescent; slightly acid; abrupt smooth boundary.

B21t—5 to 16 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark brown (10YR 2/2) moist; moderate fine and medium angular blocky structure; slightly hard, friable, sticky and plastic; many clay films in root channels, in pores, and on faces of peds; noneffervescent; slightly acid; clear smooth boundary.

B22t—16 to 23 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; common clay films on faces of peds; noneffervescent; neutral; clear smooth boundary.

Cl—23 to 46 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, friable, very sticky and plastic; noneffervescent; slightly acid; gradual smooth boundary.

C2ca—46 to 60 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, firm, sticky and plastic; 10 percent pebbles and cobbles; common fine soft masses of lime; strongly effervescent; mildly alkaline.

The mollic epipedon is 16 inches to more than 25 inches thick.

The B2t horizon is silty clay loam or clay loam. The C horizon is loam, clay loam, or silty clay loam. The C horizon of the sandy substratum phase is very fine sandy loam to loamy fine sand.

The Bowbells soils in this survey area are a taxadjunct to the Bowbells series because the subsoil and upper part of the substratum are silty clay loam.

Bowdoin Series

The Bowdoin series consists of deep, moderately well drained and well drained soils on flood plains and low terraces. These soils formed in alluvium. Slopes range from 0 to 2 percent.

These soils are very-fine, montmorillonitic, frigid Udorthentic Chromusterts.

Typical pedon of Bowdoin clay, protected, 0 to 2 percent slopes, 1,700 feet west and 800 feet north of the southeast corner of sec. 19, T. 27 N., R. 47 E.

A1—0 to 3 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium granular structure; hard, firm, very sticky and very plastic; common fine roots; slightly effervescent; moderately alkaline; clear smooth boundary.

C1—3 to 16 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; few fine

distinct light olive brown (2.5Y 5/4) mottles, olive brown (2.5Y 4/4) moist; massive; very hard, very firm, very sticky and very plastic; common fine roots; common fine pores; few soft fine salt crystals; strongly effervescent; moderately alkaline; gradual smooth boundary.

C2—16 to 60 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; few fine and medium distinct mottles that are gray (N 5/0) and olive brown (2.5Y 4/4) when moist; massive; very hard, very firm, very sticky and very plastic; few fine roots; few fine tubular pores; common soft fine and medium gypsum crystals; violently effervescent; moderately alkaline.

The C horizon has 15 to 25 percent exchangeable sodium. Some pedons have faint to distinct mottles or thin strata of silty clay loam and silt loam.

Cabba Series

The Cabba series consists of shallow, well drained soils on uplands. These soils formed in material derived from weakly consolidated sedimentary beds. Slopes range from 8 to 45 percent.

These soils are loamy, mixed (calcareous), frigid, shallow Typic Ustorthents.

Typical pedon of a Cabba silt loam in an area of Cabba-Cambert-Rock outcrop complex, 15 to 45 percent slopes, 2,000 feet south and 2,000 feet west of the northeast corner of sec. 26, T. 29 N., R. 53 E.

A1—0 to 5 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate medium platy structure; hard, friable, slightly sticky and slightly plastic; many fine and medium roots; common fine tubular pores and few medium tubular pores; few angular pebbles; strongly effervescent; moderately alkaline; clear smooth boundary.

C1ca—5 to 18 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, sticky and plastic; common fine and medium roots; common fine tubular pores and few medium tubular pores; few angular pebbles; many soft fine masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

C2r—18 to 60 inches; light brownish gray (2.5Y 6/2) weakly consolidated sedimentary beds that crush to light silty clay loam, grayish brown (2.5Y 5/2) moist; hard, friable, sticky and plastic; few fine and medium roots 8 to 10 inches apart in cracks; few fine and medium tubular pores; violently effervescent; strongly alkaline.

The A horizon is mildly alkaline or moderately alkaline. The C horizon is very fine sandy loam to silty clay loam. Depth to weakly consolidated sedimentary beds is 10 to 20 inches.

Cambert Series

The Cambert series consists of moderately deep, well drained soils on ridges and hills. These soils formed in material derived from weakly consolidated sedimentary beds. Slopes range from 8 to 25 percent.

These soils are fine-silty, mixed, frigid Typic Ustochrepts.

Typical pedon of a Cambert silt loam, in an area of Cabba-Cambert silt loams, 15 to 45 percent slopes, 1,300 feet west and 100 feet south of the northeast corner of sec. 12, T. 28 N., R. 53 E.

A1—0 to 4 inches; brown (10YR 5/3) silt loam, brown (10YR 4/3) moist; moderate medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and medium roots; common fine tubular pores; violently effervescent; mildly alkaline; clear smooth boundary.

B2—4 to 24 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common fine and medium roots; common fine tubular pores; violently effervescent; moderately alkaline; gradual smooth boundary.

C1ca—24 to 30 inches; pale yellow (2.5Y 7/4) silt loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common fine and medium roots; few fine tubular pores; common fine soft masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

C2r—30 to 42 inches; pale yellow (2.5Y 7/4) weakly consolidated sedimentary beds that crush to silt loam, light olive brown (2.5Y 5/4) moist; slightly hard, friable, slightly sticky and nonplastic; few fine roots scattered in upper part; few fine tubular pores; violently effervescent; moderately alkaline; gradual smooth boundary.

C3r—42 to 60 inches; pale yellow (2.5Y 7/4) weakly consolidated sedimentary beds that crush to silt loam, light olive brown (2.5Y 5/4) moist; slightly hard, friable, slightly sticky and nonplastic; violently effervescent; moderately alkaline.

Depth to lime is 0 to 10 inches. The surface layer is neutral to moderately alkaline. The B and C horizons are dominantly silt loam, but they are silty clay loam in some pedons. The B and C horizons are mildly alkaline or moderately alkaline. Depth to weakly consolidated sedimentary beds is 20 to 36 inches.

Cherry Series

The Cherry series consists of deep, well drained soils on fans and foot slopes. These soils formed in alluvium derived from sedimentary material. Slopes range from 2 to 8 percent.

These soils are fine-silty, mixed, frigid Typic Ustochrepts.

Typical pedon of Cherry silt loam, 2 to 8 percent slopes, 1,300 feet north and 300 feet east of the southwest corner of sec. 1, T. 28 N., R. 53 E.

A1—0 to 4 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; weak medium platy structure parting to moderate fine subangular blocky; hard, friable, slightly sticky and slightly plastic; many fine roots; many fine tubular pores; noneffervescent; mildly alkaline; clear smooth boundary.

B2—4 to 15 inches; brown (10YR 5/3) silt loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common fine roots; many fine tubular pores; noneffervescent; mildly alkaline; gradual smooth boundary.

B3ca—15 to 28 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; many fine tubular pores; violently effervescent; moderately alkaline; gradual smooth boundary.

C1ca—28 to 60 inches; very pale brown (10YR 7/3) silt loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; many fine tubular pores; violently effervescent; moderately alkaline.

The A horizon is neutral to moderately alkaline. The B and C horizons are silt loam or silty clay loam. The C horizon is moderately alkaline or strongly alkaline.

Dimmick Series

The Dimmick series consists of deep, very poorly drained soils in depressional areas and old lake basins on uplands. These soils formed in alluvium. Slopes range from 0 to 1 percent.

These soils are fine, montmorillonitic, frigid Typic Haplaquolls.

Typical pedon of Dimmick silty clay, 0 to 1 percent slopes, 1,600 feet south and 30 feet west of the northeast corner of sec. 34, T. 30 N., R. 58 E.

O1—1 inch to 0; roots and partly decomposed stems and leaves.

A11g—0 to 3 inches; gray (5Y 5/1) silty clay loam, very dark gray (5Y 3/1) moist; few fine distinct brownish yellow (10YR 6/6) mottles; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; many fine roots and common medium roots; few fine tubular pores; noneffervescent; neutral; clear wavy boundary.

A12g—3 to 7 inches; gray (5Y 5/1) silty clay, very dark gray (5Y 3/1) moist; common fine distinct brownish yellow (10YR 6/6) mottles; moderate medium subangular blocky structure; slightly hard, firm, sticky and plastic; common fine and medium roots; few fine tubular pores; noneffervescent; neutral; clear wavy boundary.

C1g—7 to 30 inches; gray (5Y 5/1) silty clay, very dark gray (5Y 3/1) moist; massive; hard, firm, very sticky and very plastic; few roots; noneffervescent; neutral; gradual wavy boundary.

C2g—30 to 42 inches; gray (5Y 5/1) silty clay, dark gray (5Y 4/1) moist; massive; hard, firm, very sticky and very plastic; noneffervescent; mildly alkaline; clear wavy boundary.

C3ca—42 to 50 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, very sticky and plastic; few fine lime concretions; strongly effervescent; mildly alkaline; clear smooth boundary.

C4ca—50 to 60 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; 2 percent pebbles; lime coatings on pebbles; violently effervescent; mildly alkaline.

The O horizon is 0 to 3 inches thick. Depth to carbonates is 25 to 50 inches. The A horizon is slightly acid or neutral. The C horizon is silty clay to clay. It is neutral or mildly alkaline.

Dooley Series

The Dooley series consists of deep, well drained soils on uplands. These soils formed in a mantle of eolian or alluvial material over glacial till. Slopes range from 0 to 4 percent.

These soils are fine-loamy, mixed Typic Argiborolls.

Typical pedon of Dooley sandy loam, 0 to 4 percent slopes, 2,310 feet west and 990 feet north of the southeast corner of sec. 19, T. 28 N., R. 52 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium granular structure; soft, very friable, slightly sticky and nonplastic; many fine and medium roots; many fine and medium tubular pores; noneffervescent; mildly alkaline; abrupt smooth boundary.

B2t—6 to 23 inches; grayish brown (10YR 5/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; soft,

friable, slightly sticky and slightly plastic; common fine roots; many fine tubular pores; common moderately thick clay films on faces of peds, in root channels, in pores, and as bridges between sand grains; strongly effervescent; moderately alkaline; clear smooth boundary.

IIC1ca—23 to 37 inches; grayish brown (2.5Y 5/2) loam, grayish brown (2.5Y 5/2) moist; massive; hard, firm, slightly sticky and slightly plastic; few fine roots; many fine tubular pores; few thin clay films in pores in upper 2 inches; 5 percent pebbles and 2 percent cobbles; few soft medium and large masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

IIC2ca—37 to 60 inches; light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, firm, sticky and plastic; few fine roots; many fine tubular pores; 5 percent pebbles and 2 percent cobbles; many soft medium and large masses of lime and many thin threadlike masses of lime; violently effervescent; moderately alkaline.

The mollic epipedon is 7 to 14 inches thick and is mildly alkaline or moderately alkaline. The B2t horizon is sandy clay loam or heavy sandy loam. Depth to glacial till is 20 to 36 inches. The IIC horizon is 0 to 10 percent pebbles and 0 to 5 percent cobbles.

Elloam Series

The Elloam series consists of deep, well drained soils on glaciated uplands. These soils formed in glacial till. Slopes range from 2 to 8 percent.

These soils are fine, montmorillonitic Borollic Natrargids.

Typical pedon of an Elloam clay loam in an area of Phillips-Elloam clay loams, 2 to 8 percent slopes, 350 feet north and 350 feet east of the southwest corner of sec. 19, T. 27 N., R. 46 E.

A2—0 to 2 inches; light gray (10YR 7/2) loam, brown (10YR 4/3) moist; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and nonplastic; common fine roots; many fine tubular pores; many bleached sand and silt grains; 1 percent pebbles; noneffervescent; neutral; abrupt smooth boundary.

B21t—2 to 8 inches; brown (10YR 5/3) light clay, brown (10YR 4/3) moist; moderate medium columnar structure; very hard, firm, very sticky and plastic; common fine roots; common fine tubular pores; many moderately thick clay films in pores, in root channels, and on faces of peds; 1 percent pebbles; slightly effervescent; strongly alkaline; clear smooth boundary.

B22t—8 to 12 inches; light brownish gray (10YR 6/2) light clay, dark grayish brown (10YR 4/2) moist; moderate medium angular blocky structure; very hard, firm, sticky and plastic; few fine roots; common fine tubular pores; common moderately thick clay films in pores, in root channels, and on faces of peds; 2 percent pebbles; violently effervescent; strongly alkaline; clear smooth boundary.

B3cacs—12 to 20 inches; light brownish gray (10YR 6/2) heavy clay loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, firm, sticky and plastic; few fine roots; common fine tubular pores; 3 percent pebbles; common soft fine and medium salt crystals; violently effervescent; strongly alkaline; clear smooth boundary.

C1ca—20 to 60 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; massive; hard, firm, sticky and plastic; few fine tubular pores; 5 percent pebbles, cobbles, and stones; common soft fine and medium masses of lime; violently effervescent; strongly alkaline.

The profile is 0 to 15 percent rock fragments, mainly pebbles and a few cobbles and stones. The A2 horizon is slightly acid or neutral. The B2t horizon is moderately alkaline or strongly alkaline. The C horizon is loam or clay loam.

Evanston Series

The Evanston series consists of deep, well drained soils on fans and terraces. These soils formed in alluvium. Slopes range from 2 to 8 percent.

These soils are fine-loamy, mixed Aridic Argiborolls.

Typical pedon of Evanston loam, 2 to 8 percent slopes, 1,200 feet east and 10 feet south of the northwest corner of sec. 11, T. 28 N., R. 46 E.

A1—0 to 4 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; many fine tubular pores; noneffervescent; neutral; abrupt smooth boundary.

B2t—4 to 12 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to strong medium and coarse subangular blocky; hard, friable, sticky and plastic; common fine roots; common fine tubular pores; common moderately thick clay films on faces of peds and in pores; noneffervescent; neutral; clear wavy boundary.

B3tca—12 to 23 inches; light brownish gray (2.5Y 6/2) heavy loam, grayish brown (2.5Y 5/2) moist; moderate medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine roots; many fine and medium tubular pores; many white (N 8/0) calcium carbonate cutans; few clay films on faces of peds and in pores;

violently effervescent; moderately alkaline; gradual smooth boundary.

C1ca—23 to 34 inches; brown (7.5YR 4/4) heavy loam, brown (7.5YR 4/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; common fine tubular pores; prominent calcium carbonate cutans on lower surfaces of coarse fragments; 15 percent pebbles; common soft medium masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

C2ca—34 to 60 inches; brown (7.5YR 4/4) fine sandy loam, brown (7.5YR 4/4) moist; massive; loose, very friable, nonsticky and nonplastic; few fine roots; few fine pores; 10 percent pebbles; violently effervescent; moderately alkaline.

The mollic epipedon is 7 to 14 inches thick. The solum is 0 to 5 percent pebbles. The A horizon is neutral or mildly alkaline. The B2t horizon is clay loam or heavy loam. The C horizon is clay loam to fine sandy loam and is 0 to 15 percent pebbles.

Farland Series

The Farland series consists of deep, well drained soils on fans and foot slopes of uplands. These soils formed in alluvium derived from sedimentary material. Slopes range from 2 to 8 percent.

These soils are fine-silty, mixed Typic Argiborolls.

Typical pedon of Farland silt loam, 2 to 8 percent slopes, 1,300 feet east and 300 feet south of the northwest corner of sec. 26, T. 36 N., R. 43 E.

Ap—0 to 7 inches; dark grayish brown (2.5Y 4/2) silt loam, very dark grayish brown (2.5Y 3/2) moist; strong fine and medium granular structure parting to moderate medium subangular blocky; soft, very friable, sticky and slightly plastic; many fine roots; many fine tubular pores; noneffervescent; mildly alkaline; abrupt smooth boundary.

B2t—7 to 11 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, sticky and plastic; many fine roots; many fine tubular pores; common clay films on faces of peds, in root channels, and in pores; noneffervescent; mildly alkaline; clear smooth boundary.

B3t—11 to 18 inches; grayish brown (2.5Y 5/2) light silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure parting to weak fine angular blocky; soft, friable, slightly sticky and slightly plastic; common fine roots; common fine tubular pores and few medium tubular pores; few clay films on faces of peds; slightly effervescent; moderately alkaline; clear smooth boundary.

C1ca—18 to 28 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; massive; soft, very friable, slightly sticky and slightly plastic; common fine roots; few pores; common soft fine masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

C2—28 to 60 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; massive; soft, very friable, sticky and slightly plastic; few fine roots; few pores; strongly effervescent; moderately alkaline.

The mollic epipedon is 7 to 14 inches thick. The surface layer is neutral or mildly alkaline. Depth to free lime is 11 to 25 inches. The C horizon is silt loam or silty clay loam.

Farnuf Series

The Farnuf series consists of deep, well drained soils on fans and terraces. These soils formed in alluvium. Slopes range from 2 to 8 percent.

These soils are fine-loamy, mixed Typic Argiborolls.

Typical pedon of Farnuf loam, 2 to 8 percent slopes, 2,300 feet west and 900 feet north of the southeast corner of sec. 29, T. 32 N., R. 51 E.

Ap—0 to 6 inches; brown (10YR 4/3) loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; common fine pores; noneffervescent; neutral; abrupt smooth boundary.

B2t—6 to 18 inches; yellowish brown (10YR 5/4) clay loam, brown (10YR 4/3) moist; strong angular blocky structure; slightly hard, friable, sticky and plastic; common fine roots and few medium roots; common fine discontinuous pores; common moderately thick clay films on faces of peds and in pores; noneffervescent; mildly alkaline; abrupt smooth boundary.

B3tca—18 to 22 inches; pale brown (10YR 6/3) heavy silt loam, yellowish brown (10YR 5/4) moist; moderate medium angular blocky structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and plastic; common fine roots and few medium roots; many fine discontinuous pores; few thin patchy clay films; common soft fine masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

C1ca—22 to 36 inches; very pale brown (10YR 7/3) silty clay loam, grayish brown (10YR 5/2) moist; massive; hard, friable, sticky and plastic; few fine roots; few fine discontinuous pores; many soft fine and medium masses of lime; violently effervescent; moderately alkaline; abrupt smooth boundary.

IIC2—36 to 60 inches; light brownish gray (10YR 6/2) sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, slightly sticky and nonplastic; 2 percent pebbles; strongly effervescent; moderately alkaline.

The mollic epipedon is 7 to 12 inches thick. The solum is 0 to 5 percent pebbles, and the substratum is 0 to 15 percent pebbles. The A horizon is neutral or mildly alkaline. The C horizon is sandy loam to silty clay loam.

Glendive Series

The Glendive series consists of deep, well drained soils on flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

These soils are coarse-loamy, mixed (calcareous), frigid Ustic Torrifluvents.

Typical pedon of Glendive fine sandy loam, protected, 0 to 2 percent slopes, 300 feet west and 300 feet south of the northeast corner of sec. 6, T. 26 N., R. 46 E.

A1—0 to 7 inches; pale brown (10YR 6/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many fine roots; common fine tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C1—7 to 15 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; many fine roots; common fine tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C2—15 to 60 inches; pale brown (10YR 6/3) fine sandy loam and thin strata of loamy sand, sandy loam, and silt loam, brown (10YR 4/3) moist; massive; soft, friable, nonsticky and nonplastic; few fine roots in upper 10 inches; violently effervescent; moderately alkaline.

Typically, the soils in the Glendive series are calcareous throughout; however, in some pedons, particularly where irrigated, the soils are leached of lime in the upper 5 to 10 inches. The A horizon is neutral to moderately alkaline. The 10- to 40-inch textural control section is mainly fine sandy loam and sandy loam, but some pedons have thin strata of sand, loamy sand, loam, or silt loam.

Grail Series

The Grail series consists of deep, well drained soils on uplands. These soils formed in local alluvium. Slopes range from 0 to 4 percent.

These soils are fine, montmorillonitic Pachic Argiborolls.

Typical pedon of Grail silty clay loam, 0 to 4 percent slopes, 2,660 feet north and 1,500 feet east of the southwest corner of sec. 3, T. 27 N., R. 52 E.

Ap—0 to 5 inches; grayish brown (10YR 5/2) silty clay loam, very dark gray (10YR 3/1) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common fine roots; common fine and medium tubular pores; noneffervescent; moderately alkaline; clear smooth boundary.

B21t—5 to 14 inches; very dark grayish brown (10YR 3/2) light silty clay, black (10YR 2/1) moist; weak medium prismatic structure parting to moderate medium angular blocky; very hard, firm, sticky and very plastic; common fine roots; many fine tubular pores; many moderately thick clay films on faces of peds, in pores, and in root channels; noneffervescent; moderately alkaline; clear smooth boundary.

B22t—14 to 22 inches; very dark grayish brown (10YR 3/2) silty clay, very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to moderate medium angular blocky; very hard, firm, sticky and very plastic; common fine roots; many fine tubular pores; many moderately thick clay films on faces of peds, in pores, and in root channels; slightly effervescent; moderately alkaline; clear smooth boundary.

B3tca—22 to 30 inches; dark grayish brown (10YR 4/2) heavy silty clay, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure; very hard, firm, sticky and very plastic; few fine roots; common fine tubular pores; common clay films on faces of peds and in pores; violently effervescent; moderately alkaline; clear smooth boundary.

C1ca—30 to 50 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; massive; very hard, firm, sticky and very plastic; few fine roots; common fine tubular pores; violently effervescent; moderately alkaline; clear smooth boundary.

C2ca—50 to 60 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; massive; very hard, firm, sticky and plastic; few fine roots; few fine tubular pores; common soft medium masses of gypsum crystals and common soft threadlike gypsum crystals; violently effervescent; moderately alkaline.

The Ap horizon is neutral to moderately alkaline. The C horizon is silty clay or silty clay loam.

Harlem Series

The Harlem series consists of deep, well drained soils on flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

These soils are fine, montmorillonitic (calcareous), frigid Ustic Torrifluvents.

Typical pedon of Harlem silty clay loam, protected, 0 to 2 percent slopes, 300 feet north and 2,000 feet east of the southwest corner of sec. 27, T. 27 N., R. 46 E.

A1—0 to 4 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse subangular blocky structure; hard, firm, sticky and plastic; many fine roots; common fine tubular pores; slightly effervescent; moderately alkaline; clear smooth boundary.

C1ca—4 to 20 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; common fine roots; common fine tubular pores; violently effervescent; moderately alkaline; gradual smooth boundary.

C2ca—20 to 60 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; few fine roots; common fine tubular pores; few fine scattered salt crystals; violently effervescent; moderately alkaline.

The 10- to 40-inch textural control section is mainly silty clay and silty clay loam, but some pedons have thin strata as coarse textured as fine sandy loam. The C horizon is moderately alkaline to a depth of about 40 inches, and it is moderately alkaline or strongly alkaline below this depth.

Havre Series

The Havre series consists of deep, well drained soils on flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

These soils are fine-loamy, mixed (calcareous), frigid Ustic Torrifluvents.

Typical pedon of Havre silt loam, protected, 0 to 2 percent slopes, 1,400 feet west and 1,200 feet north of the southeast corner of sec. 5, T. 26 N., R. 46 E.

A1—0 to 7 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; common fine tubular pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C1—7 to 32 inches; pale brown (10YR 6/3) loam and thin lenses of fine sandy loam and very fine sandy loam, brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; few fine tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C2—32 to 60 inches; pale brown (10YR 6/3) loam and thin lenses of fine sandy loam and very fine sandy loam, brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine roots in upper 4 inches; few fine tubular pores; strongly effervescent; moderately alkaline.

The profile is mildly alkaline or moderately alkaline.

Havrelon Series

The Havrelon series consists of deep, well drained soils on flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

These soils are fine-loamy, mixed (calcareous), frigid Typic Ustifluvents.

Typical pedon of Havrelon silt loam, protected, 0 to 2 percent slopes, 1,400 feet west and 1,400 feet south of the northeast corner of sec. 27, T. 28 N., R. 53 E.

Ap—0 to 6 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine roots; common fine tubular pores and many medium tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

A12—6 to 13 inches; light brownish gray (10YR 6/2) heavy silt loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; very hard, friable, slightly sticky and plastic; common fine roots; common fine tubular pores and many medium tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C1—13 to 34 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; common fine roots; common fine tubular pores; violently effervescent; moderately alkaline; gradual smooth boundary.

C2—34 to 55 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, sticky and plastic; few fine roots; common fine tubular pores; violently effervescent; moderately alkaline; abrupt smooth boundary.

C3—55 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, sticky and plastic; few fine roots; many fine tubular pores; violently effervescent; moderately alkaline.

The A horizon is dominantly silt loam or loam. In some pedons the 10- to 40-inch textural control section has thin strata of sandy loam to silty clay. The profile is mildly alkaline or moderately alkaline.

Hillon Series

The Hillon series consists of deep, well drained soils on glaciated uplands. These soils formed in glacial till. Slopes range from 2 to 45 percent.

These soils are fine-loamy, mixed (calcareous), frigid Ustic Torriorthents.

Typical pedon of a Hillon loam in an area of Hillon-Tinsley complex, 15 to 45 percent slopes, 1,200 feet east and 1,000 feet north of the southwest corner of sec. 18, T. 27 N., R. 46 E.

A1—0 to 7 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; common fine and medium tubular pores; 10 percent pebbles and 1 percent stones; few soft fine and medium masses of lime below a depth of 3 inches; violently effervescent; moderately alkaline; clear smooth boundary.

Cca—7 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, firm, sticky and plastic; common fine roots in upper 20 inches and few roots below; common fine and medium tubular pores; 10 percent pebbles and 1 percent stones; violently effervescent; moderately alkaline.

The profile is mildly alkaline or moderately alkaline. It is 0 to 10 percent pebbles and 0 to 5 percent coarse fragments larger than 3 inches in diameter.

Lallie Series

The Lallie series consists of deep, very poorly drained soils in oxbows and lake basins. These soils formed in alluvium. Slopes range from 0 to 2 percent.

These soils are fine, montmorillonitic (calcareous), frigid Typic Fluvaquents.

Typical pedon of Lallie silty clay, saline, 0 to 2 percent slopes, 1,980 feet south and 100 feet west of the northeast corner of sec. 15, T. 27 N., R. 47 E.

A1—0 to 3 inches; gray (5Y 5/1) silty clay, very dark gray (5Y 3/1) moist; moderate medium granular structure; hard, firm, sticky and plastic; many fine and medium roots; few fine tubular pores; slightly effervescent; moderately alkaline; clear smooth boundary.

C1g—3 to 20 inches; light gray (5Y 6/1) light clay, dark gray (5Y 4/1) moist; moderate very coarse prismatic structure parting to moderate coarse angular blocky; very hard, very firm, sticky and plastic; common fine and medium roots; few fine tubular pores; few soft fine and medium salt crystals; strongly effervescent; moderately alkaline; clear smooth boundary.

C2sa—20 to 42 inches; gray (5Y 5/1) silty clay, dark gray (5Y 4/1) moist; common fine and medium prominent mottles that are brown (10YR 4/3) when moist; massive; hard, firm, sticky and plastic; few fine roots; few fine tubular pores; common soft salt crystals; strongly effervescent; strongly alkaline; gradual smooth boundary.

C3sa—42 to 60 inches; gray (5Y 5/1) silty clay, dark gray (5Y 4/1) moist; many fine and medium prominent mottles that are brown (10YR 4/3) and light brownish gray (10YR 6/2) when moist; massive; hard, firm, sticky and plastic; few fine roots; few fine tubular pores; many soft salt crystals; strongly effervescent; strongly alkaline.

The profile is mildly alkaline to strongly alkaline, and the electrical conductivity is 8 to 16 millimhos per cubic centimeter. Some pedons have an O horizon less than 1 inch thick. Depth to a high water table is 0 to 18 inches from April through June. The C horizon is silty clay loam to clay.

Lihen Series

The Lihen series consists of deep, somewhat excessively drained soils on terraces and uplands. These soils formed in alluvial and eolian deposits. Slopes range from 1 to 8 percent.

These soils are sandy, mixed Entic Haploborolls.

Typical pedon of Lihen sandy loam, 2 to 8 percent slopes, 2,680 feet south and 2,600 feet west of the northeast corner of sec. 14, T. 29 N., R. 53 E.

A11—0 to 4 inches; dark grayish brown (10YR 4/2) sandy loam, very dark brown (10YR 2/2) moist; weak fine platy structure; soft, very friable, nonsticky and nonplastic; many fine roots; many fine and medium tubular pores; 2 percent pebbles; noneffervescent; mildly alkaline; clear smooth boundary.

A12—4 to 9 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; many fine roots; common fine tubular pores and few medium tubular pores; 10 percent pebbles; noneffervescent; mildly alkaline; clear smooth boundary.

C1ca—9 to 24 inches; grayish brown (10YR 5/2) loamy sand, very dark grayish brown (10YR 3/2) moist; massive; loose, very friable, nonsticky and nonplastic; common fine roots; few pores; calcium carbonate cutans on lower surfaces of pebbles; 10 percent pebbles; slightly effervescent; moderately alkaline; clear smooth boundary.

C2ca—24 to 32 inches; light brownish gray (2.5Y 6/2) sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose, nonsticky and nonplastic; few fine

roots; calcium carbonate cutans on lower surfaces of pebbles; 10 percent pebbles; strongly effervescent; moderately alkaline; clear smooth boundary.

C3—32 to 60 inches; light brownish gray (2.5Y 6/2) sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose, nonsticky and nonplastic; few fine roots; strongly effervescent; moderately alkaline.

The A horizon is neutral or mildly alkaline. Calcareous material is mainly at a depth of 9 to 24 inches. The Cca horizon is mildly alkaline or moderately alkaline. The profile is 0 to 10 percent coarse fragments, mainly pebbles.

Lisam Series

The Lisam series consists of shallow, well drained soils on uplands. These soils formed in material derived from consolidated shale. Slopes range from 6 to 45 percent.

These soils are clayey, montmorillonitic (calcareous), frigid, shallow Ustic Torriorthents.

Typical pedon of a Lisam silty clay in an area of Vanda Variant-Thebo-Lisam complex, 4 to 15 percent slopes, 1,980 feet west and 1,320 feet north of the southeast corner of sec. 11, T. 27 N., R. 47 E.

A1—0 to 4 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium granular structure; hard, firm, sticky and plastic; many fine roots and common medium roots; few fine tubular pores; slightly effervescent; moderately alkaline; abrupt smooth boundary.

C1—4 to 12 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate coarse subangular blocky; very hard, very firm, sticky and plastic; many fine roots; few fine tubular pores; slightly effervescent; moderately alkaline; clear smooth boundary.

C2—12 to 17 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, very firm, sticky and plastic; common fine roots; few fine tubular pores; few soft fine gypsum crystals; slightly effervescent; moderately alkaline; clear wavy boundary.

C3r—17 to 60 inches; consolidated shale; few fine roots scattered along shale plates in upper few inches; many soft medium and coarse gypsum crystals; noneffervescent; slightly acid.

Depth to consolidated shale is 10 to 20 inches. The profile is mildly alkaline or moderately alkaline.

Lohler Series

The Lohler series consists of deep, moderately well drained soils on flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

These soils are fine, montmorillonitic (calcareous), frigid Typic Ustifluvents.

Typical pedon of Lohler silty clay, protected, 0 to 2 percent slopes, 700 feet south and 1,900 feet west of the northeast corner of sec. 21, T. 27 N., R. 47 E.

A1—0 to 3 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; strong medium and coarse granular structure; hard, firm, slightly sticky and plastic; many fine and medium roots; few fine tubular pores; slightly effervescent; moderately alkaline; abrupt smooth boundary.

C1—3 to 17 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium and coarse angular blocky structure; very hard, very firm, sticky and plastic; common fine and medium roots; few fine tubular pores; slightly effervescent; moderately alkaline; clear wavy boundary.

C2—17 to 24 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, sticky and plastic; many fine roots; few fine tubular pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C3—24 to 39 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, sticky and plastic; few fine roots; few fine tubular pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C4—39 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; discontinuous strata of silty clay loam less than 1 inch thick; massive; very hard, very firm, sticky and plastic; few fine roots; strongly effervescent; moderately alkaline.

The A horizon is mildly alkaline or moderately alkaline. The C horizon is heavy silty clay loam to clay.

Martinsdale Series

The Martinsdale series consists of deep, well drained soils on fans and terraces on uplands. These soils formed in alluvium. Slopes range from 1 to 8 percent.

These soils are fine-loamy, mixed Typic Argiborolls.

Typical pedon of Martinsdale loam, 1 to 8 percent slopes, 1,200 feet east and 400 feet north of the southwest corner of sec. 14, T. 31 N., R. 46 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) light loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic;

common fine tubular pores; noneffervescent; neutral; abrupt smooth boundary.

B2t—6 to 14 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, firm, sticky and plastic; common fine tubular pores; many moderately thick clay films on faces of peds and in pores; noneffervescent; neutral; clear smooth boundary.

B3t—14 to 21 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; hard, firm, sticky and plastic; common fine tubular pores; few thin scattered clay films in pores; noneffervescent; moderately alkaline; clear smooth boundary.

C1ca—21 to 36 inches; very pale brown (10YR 7/3) loam, pale brown (10YR 6/3) moist; massive; hard, firm, sticky and plastic; many fine tubular pores; many medium soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

C2ca—36 to 60 inches; very pale brown (10YR 8/3) loam, pale brown (10YR 6/3) moist; massive; hard, firm, sticky and plastic; many medium soft masses of lime; violently effervescent; moderately alkaline.

The A horizon is neutral or mildly alkaline. The B2t horizon is dominantly clay loam, but in some pedons it is sandy clay loam. The B2t horizon is neutral to moderately alkaline. The C horizon is sandy loam to clay loam. Calcium carbonate equivalent in the Cca horizon is 20 to 35 percent. The profile is 0 to 10 percent coarse fragments.

McKenzie Series

The McKenzie series consists of deep, poorly drained soils in depressional areas and lake basins on uplands. These soils formed in alluvium. Slopes range from 0 to 2 percent.

These soils are fine, montmorillonitic (calcareous), frigid Typic Haplaquepts.

Typical pedon of McKenzie clay loam, 0 to 2 percent slopes, 1,320 feet south and 600 feet west of the northeast corner of sec. 30, T. 28 N., R. 48 E.

A1—0 to 2 inches; grayish brown (2.5Y 5/2) light clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium granular structure; hard, firm, slightly sticky and slightly plastic; many fine and medium roots; noneffervescent; neutral; abrupt smooth boundary.

B21—2 to 8 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; few fine faint olive gray (5Y 4/2) mottles; strong medium prismatic structure parting to strong medium and coarse angular blocky; very hard, very firm, sticky and plastic; many fine roots; many fine tubular pores; noneffervescent; neutral; clear smooth boundary.

B22—8 to 16 inches; grayish brown (2.5Y 5/2) silty clay, dark gray (10YR 4/1) moist; strong medium prismatic structure parting to strong medium and coarse angular blocky; very hard, very firm, very sticky and plastic; many fine roots; common fine tubular pores; slightly effervescent; mildly alkaline; gradual smooth boundary.

B23—16 to 26 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; many fine roots; common fine tubular pores; few slickensides in lower 4 inches; slightly effervescent; mildly alkaline; clear smooth boundary.

C1—26 to 32 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; massive; very hard, very firm, very sticky and plastic; many fine roots; common fine tubular pores; few slickensides; slightly effervescent; strongly alkaline; clear smooth boundary.

C2—32 to 60 inches; dark gray (10YR 4/1) silty clay, very dark grayish brown (10YR 3/2) moist; massive; very hard, very firm, very sticky and plastic; common fine roots; common fine tubular pores; violently effervescent; strongly alkaline.

The A and B horizons are neutral or mildly alkaline. The C horizon is moderately alkaline or strongly alkaline. The B and C horizons are dominantly silty clay, but in some pedons they are clay.

The McKenzie soils in this survey are a taxadjunct to the McKenzie series because they are neutral or mildly alkaline between depths of 0 and 26 inches.

Nishon Series

The Nishon series consists of deep, somewhat poorly drained or poorly drained soils in depressional areas and lake basins on uplands. These soils formed in alluvium. Slopes range from 0 to 2 percent.

These soils are fine, montmorillonitic, frigid Typic Albaqualfs.

Typical pedon of Nishon clay loam, 0 to 2 percent slopes, 1,600 feet north and 2,000 feet east of the southwest corner of sec. 34, T. 30 N., R. 48 E.

A2—0 to 4 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; common medium prominent yellowish brown (10YR 5/4) mottles; moderate fine platy structure; slightly hard, very friable, nonsticky and slightly plastic; many fine and medium roots; many fine tubular pores; 2 percent pebbles; noneffervescent; neutral; abrupt smooth boundary.

B2t—4 to 17 inches; gray (10YR 5/1) clay, very dark grayish brown (10YR 3/2) moist; strong coarse

columnar structure; extremely hard, very firm, very sticky and very plastic; common fine roots; few fine tubular pores; many moderately thick clay films on faces of peds and in pores; 2 percent pebbles; noneffervescent; mildly alkaline; clear smooth boundary.

B3tca—17 to 21 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium and coarse angular blocky structure; hard, firm, sticky and plastic; few fine roots; few fine tubular pores; few moderately thick clay films on faces of peds and in pores; common soft large masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

C1ca—21 to 47 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, sticky and plastic; few fine roots; many fine tubular pores; 2 percent pebbles; lime cutans on lower surfaces of pebbles; common soft medium and large masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

C2ca—47 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, friable, sticky and plastic; few fine roots; few medium tubular pores; 2 percent pebbles; common soft threadlike masses of lime; violently effervescent; strongly alkaline.

The A horizon is slightly acid to mildly alkaline. The B horizon is mildly alkaline or moderately alkaline. The C horizon is dominantly clay loam and clay, but in some pedons it is silty clay. The C horizon is moderately alkaline or strongly alkaline. The profile is 0 to 5 percent coarse fragments, mainly pebbles.

Nobe Series

The Nobe series consists of deep, moderately well drained soils on fans, foot slopes, and flood plains. These soils formed in alluvium. Slopes range from 0 to 4 percent.

These soils are fine, montmorillonitic (calcareous), frigid Ustic Torriorthents.

Typical pedon of Nobe silty clay, flooded, 0 to 2 percent slopes, 20 feet south and 1,000 feet west of the northeast corner of sec. 36, T. 37 N., R. 46 E.

A2—0 to 2 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium platy structure; slightly hard, firm, slightly sticky and nonplastic; many fine and medium roots; few fine tubular pores; violently effervescent; moderately alkaline; abrupt smooth boundary.

B2—2 to 5 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium columnar structure parting to moderate medium subangular and angular blocky; hard, firm, sticky and plastic; common fine roots throughout and many fine and medium roots on faces of peds; common fine tubular pores; few fine soft masses of salts; violently effervescent; very strongly alkaline; clear smooth boundary.

C1sa—5 to 36 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; common fine and medium roots in upper 5 inches; common fine tubular pores; common fine and medium masses and threads of salts; violently effervescent; very strongly alkaline; gradual smooth boundary.

C2sa—36 to 60 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, firm, sticky and plastic; few fine roots; few fine tubular pores; common fine soft masses of salts; strongly effervescent; very strongly alkaline.

The A horizon is neutral to moderately alkaline. Depth to calcareous material is 0 to 4 inches. Depth to the Csa horizon is 4 to 12 inches. The Csa horizon is silty clay loam to silty clay and is moderately alkaline to very strongly alkaline.

Parshall Series

The Parshall series consists of deep, well drained and moderately well drained soils in depressional areas on uplands. These soils formed in alluvium. Slopes range from 0 to 4 percent.

These soils are coarse-loamy, mixed Pachic Haploborolls.

Typical pedon of Parshall sandy loam, 0 to 4 percent slopes, 1,320 feet north and 600 feet east of the southwest corner of sec. 20, T. 28 N., R. 53 E.

A1—0 to 3 inches; dark brown (10YR 3/3) sandy loam, very dark brown (10YR 2/2) moist; moderate fine and medium granular structure; soft, friable, nonsticky and nonplastic; many fine roots; noneffervescent; moderately alkaline; clear smooth boundary.

B2—3 to 12 inches; dark brown (10YR 3/3) sandy loam, very dark brown (10YR 2/2) moist; moderate medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many fine roots; few fine tubular pores; noneffervescent; moderately alkaline; clear smooth boundary.

B3—12 to 25 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many fine roots; few fine tubular pores; noneffervescent; moderately alkaline; gradual smooth boundary.

C1—25 to 32 inches; brown (10YR 4/3) heavy loamy sand, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, nonsticky and nonplastic;

common fine roots; few fine tubular pores; noneffervescent; moderately alkaline; gradual smooth boundary.

C2ca—32 to 42 inches; grayish brown (2.5Y 5/2) loamy sand, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; few fine and medium roots; common fine tubular pores; strongly effervescent; moderately alkaline; gradual smooth boundary.

C3ca—42 to 60 inches; grayish brown (2.5Y 5/2) loamy sand, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; few fine roots; common fine tubular pores; violently effervescent; moderately alkaline.

Depth to carbonates is 24 to 48 inches. The profile is 0 to 2 percent pebbles. The A horizon is neutral to moderately alkaline. The C horizon is fine sandy loam to loamy sand.

In this survey area the Parshall soils, silty substratum, are silt loam to clay loam in the lower part of the substratum and are mildly alkaline or moderately alkaline. Depth to a perched water table in these soils is 45 to 60 inches from April to September.

Phillips Series

The Phillips series consists of deep, well drained soils on glaciated uplands. These soils formed in glacial till. Slopes range from 2 to 8 percent.

These soils are fine, montmorillonitic Borollic Paleargids.

Typical pedon of a Phillips clay loam in an area of Phillips-Elloam clay loams, 2 to 8 percent slopes, 900 feet north and 700 feet east of the southwest corner of sec. 19, T. 27 N., R. 46 E.

A2—0 to 3 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; common fine tubular pores; many uncoated sand and silt grains; 1 percent pebbles; noneffervescent; neutral; abrupt smooth boundary.

B21t—3 to 8 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; moderate medium and coarse prismatic structure parting to strong medium angular blocky; very hard, very firm, sticky and plastic; many fine roots between peds; common fine tubular pores; many moderately thick clay films on faces of peds, in root channels, and in pores; 1 percent pebbles and 1 percent cobbles; noneffervescent; neutral; clear smooth boundary.

B22t—8 to 15 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; moderate medium and coarse prismatic structure parting to strong medium angular blocky; very hard, very firm, sticky and plastic; common fine roots between peds; common fine tubular pores; common moderately thick clay films on faces of peds, in pores, and in root channels; 1 percent pebbles and 1 percent cobbles; noneffervescent; moderately alkaline; clear smooth boundary.

B3tca—15 to 25 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; hard, firm, sticky and plastic; few fine roots; common fine tubular pores; few thin clay films on faces of peds, in root channels, and in pores; 3 percent pebbles and 1 percent cobbles; common soft fine and medium masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

C1ca—25 to 60 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; massive; hard, firm, sticky and plastic; few fine roots; common fine tubular pores; 3 percent pebbles, 1 percent cobbles, and 3 percent stones; many soft fine and medium masses of lime; strongly effervescent; moderately alkaline.

The A horizon is slightly acid or neutral. The B horizon is clay or heavy clay loam and is neutral to moderately alkaline. The C horizon is clay loam or loam and is 0 to 10 percent coarse fragments.

Savage Series

The Savage series consists of deep, well drained soils on fans and terraces on uplands. These soils formed in alluvium. Slopes range from 2 to 8 percent.

These soils are fine, montmorillonitic Typic Argiborolls.

Typical pedon of Savage clay loam, 2 to 8 percent slopes, 2,500 feet north and 100 feet east of the southwest corner of sec. 31, T. 32 N., R. 46 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few fine tubular pores; 1 percent pebbles; slightly effervescent; mildly alkaline; abrupt smooth boundary.

B21t—6 to 9 inches; grayish brown (10YR 5/2) light clay, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to strong medium subangular blocky; hard, firm, sticky and plastic; few fine tubular pores; common moderately thick clay films on faces of peds; 1 percent pebbles; slightly effervescent; mildly alkaline; clear smooth boundary.

B22t—9 to 15 inches; grayish brown (10YR 5/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to strong medium subangular blocky; very hard, very firm, sticky and plastic; few fine tubular pores; continuous clay films on faces of peds; 1 percent pebbles; slightly

effervescent; moderately alkaline; clear smooth boundary.

B3tca—15 to 24 inches; light brownish gray (10YR 6/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few fine tubular pores; few thin patchy clay films on faces of peds; 3 percent pebbles; many soft masses and threads of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

C1ca—24 to 60 inches; light brownish gray (10YR 6/2) silty clay, dark grayish brown (10YR 4/2) moist; massive; hard, firm, sticky and plastic; few fine tubular pores; 5 percent pebbles; common soft masses and threads of lime; violently effervescent; moderately alkaline.

The mollic epipedon is 7 to 16 inches thick. The Bt horizon is dominantly clay, but in some pedons it is heavy silty clay loam or silty clay. The Bt and C horizons are mildly alkaline or moderately alkaline. The profile is 0 to 15 percent coarse fragments, of which 0 to 10 percent is pebbles and 0 to 5 percent is cobbles.

Tally Series

The Tally series consists of deep, well drained soils on terraces and foot slopes on uplands. These soils formed in alluvial and eolian deposits. Slopes range from 1 to 15 percent.

These soils are coarse-loamy, mixed Typic Haploborolls.

Typical pedon of Tally sandy loam, 2 to 8 percent slopes, 2,400 feet east and 2,200 feet north of the southwest corner of sec. 7, T. 29 N., R. 56 E.

Ap—0 to 6 inches; dark brown (10YR 3/3) sandy loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; noneffervescent; neutral; abrupt smooth boundary.

B2—6 to 14 inches; dark brown (10YR 3/3) heavy sandy loam, very dark brown (10YR 2/2) moist; moderate medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; noneffervescent; neutral; clear smooth boundary.

B3—14 to 32 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak fine and medium subangular structure; slightly hard, friable, slightly sticky and nonplastic; noneffervescent; neutral; clear smooth boundary.

C1ca—32 to 38 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and nonplastic; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.

C2ca—38 to 60 inches; light yellowish brown (2.5Y 6/4) heavy sandy loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, slightly sticky and nonplastic; disseminated lime; violently effervescent; moderately alkaline.

The A horizon is neutral or mildly alkaline. The C horizon is fine sandy loam to loamy fine sand. The mollic epipedon is 10 to 15 inches thick. Depth to carbonates is 10 to 35 inches. The profile is 0 to 15 percent pebbles.

Telstad Series

The Telstad series consists of deep, well drained soils on glaciated uplands. These soils formed in glacial till. Slopes range from 2 to 8 percent.

These soils are fine-loamy, mixed Aridic Argiborolls.

Typical pedon of Telstad loam, 2 to 8 percent slopes, 500 feet west and 200 feet north of the southeast corner of sec. 18, T. 27 N., R. 46 E.

A1—0 to 5 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, friable, slightly sticky and nonplastic; many fine roots; common fine and medium tubular pores; 2 percent pebbles; noneffervescent; mildly alkaline; clear smooth boundary.

B2t—5 to 15 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium angular and subangular blocky; hard, firm, sticky and plastic; many fine roots; common fine and medium tubular pores; common moderately thick clay films on faces of peds, in root channels, and in pores; 4 percent pebbles; noneffervescent; moderately alkaline; clear smooth boundary.

B3tca—15 to 24 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak medium and coarse subangular blocky structure; hard, firm, sticky and plastic; common fine roots; common fine and medium tubular pores; few moderately thick clay films on faces of peds, in root channels, and in pores; 5 percent pebbles and 1 percent cobbles; few soft fine masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

C1ca—24 to 60 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; massive; hard, firm, sticky and plastic; few fine roots; common fine and medium tubular pores; 8 percent pebbles and 2 percent cobbles; common soft fine masses of lime; violently effervescent; moderately alkaline.

The A horizon is neutral or mildly alkaline. The B and C horizons are mildly alkaline or moderately alkaline. The C horizon is loam to clay loam. Depth to carbonates is

10 to 20 inches. The profile is 0 to 10 percent coarse fragments.

Thebo Series

The Thebo series consists of moderately deep, well drained soils on uplands. These soils formed in material derived from consolidated shale. Slopes range from 4 to 35 percent.

These soils are very-fine, montmorillonitic, frigid Udorthentic Chromusterts.

Typical pedon of a Thebo clay in an area of Vanda Variant-Thebo-Lisam complex, 4 to 15 percent slopes, 1,600 feet north and 300 feet east of the southwest corner of sec. 30, T. 29 N., R. 51 E.

A1—0 to 2 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium granular structure; very hard, firm, sticky and plastic; many fine roots; few fine tubular pores; 1 percent pebbles; slightly effervescent; mildly alkaline; clear smooth boundary.

C1—2 to 25 inches; grayish brown (2.5Y 5/2) heavy clay, dark grayish brown (2.5Y 4/2) moist; strong coarse prismatic structure; extremely hard, very firm, very sticky and very plastic; common fine roots; few fine tubular pores; 1 percent pebbles; common slickensides that intersect at a 30- to 40-degree angle from horizontal; few soft masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

C2ca—25 to 32 inches; grayish brown (2.5Y 5/2) heavy clay, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, very firm, very sticky and very plastic; few fine roots; few fine tubular pores; common soft masses and threads of lime; violently effervescent; moderately alkaline; clear smooth boundary.

C3r—32 to 60 inches; gray (5Y 6/1) consolidated shale, dark gray (5Y 4/1) moist; few gypsum crystals between shale plates; neutral.

Depth to consolidated shale is 20 to 40 inches. The A horizon is 0 to 10 percent pebbles. Surface cracks range from 1 to 3 inches in width during the dry periods late in summer.

Tinsley Series

The Tinsley series consists of deep, excessively drained soils on upland knolls and ridges and on terrace edges. These soils formed in outwash. Slopes range from 8 to 45 percent.

These soils are sandy-skeletal, mixed, frigid Typic Ustorthents.

Typical pedon of Tinsley very gravelly sandy loam, 15 to 45 percent slopes, 1,200 feet east and 2,375 feet north of the southwest corner of sec. 5, T. 28 N., R. 46 E.

A1—0 to 3 inches; brown (10YR 4/3) very gravelly sandy loam, very dark brown (10YR 2/2) moist; weak medium and coarse granular structure; loose, nonsticky and nonplastic; many fine roots; common fine and medium irregular and tubular pores; 40 percent pebbles and 5 percent cobbles; noneffervescent; neutral; clear smooth boundary.

C1—3 to 45 inches; pale brown (10YR 6/3) very gravelly sand, pale brown (10YR 6/3) moist; single grain; loose, nonsticky and nonplastic; common fine and medium roots; common irregular and tubular pores; 40 percent pebbles and 5 percent cobbles; calcium carbonate cutans on lower surfaces of coarse fragments; noneffervescent; neutral; gradual smooth boundary.

C2ca—45 to 60 inches; pale brown (10YR 6/3) very gravelly sand, pale brown (10YR 6/3) moist; single grain; loose, nonsticky and nonplastic; 40 percent pebbles and 5 percent cobbles; prominent calcium carbonate coatings on lower surfaces of coarse fragments; strongly effervescent; moderately alkaline.

The A horizon is 40 to 50 percent pebbles and 2 to 10 percent cobbles. The C horizon is 35 to 55 percent pebbles and 5 to 25 percent cobbles.

Trembles Series

The Trembles series consists of deep, well drained soils on flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

These soils are coarse-loamy, mixed (calcareous), frigid Typic Ustifluvents.

Typical pedon of Trembles fine sandy loam, protected, 0 to 2 percent slopes, 2,480 feet east and 1,040 feet south of the northwest corner of sec. 13, T. 27 N., R. 52 E.

A1—0 to 8 inches; light brownish gray (2.5Y 6/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many fine and medium roots and few coarse roots; common fine tubular pores; slightly effervescent; moderately alkaline; clear smooth boundary.

C1—8 to 31 inches; brown (10YR 5/3) sandy loam and few thin strata of loam, grayish brown (10YR 5/2) moist; massive; loose, very friable, nonsticky and nonplastic; many fine and medium roots and few coarse roots; strongly effervescent; moderately alkaline; clear smooth boundary.

C2—31 to 48 inches; pale brown (10YR 6/3) sandy loam and few thin strata of loam and loamy sand, dark

grayish brown (10YR 4/2) moist; massive; soft, friable, nonsticky and nonplastic; common fine and medium roots; strongly effervescent; moderately alkaline; clear smooth boundary.

C3—48 to 60 inches; pale brown (10YR 6/3) loamy sand and few thin strata of sandy loam, brown (10YR 5/3) moist; massive; loose, very friable, nonsticky and nonplastic; common fine roots; strongly effervescent; moderately alkaline.

The 10- to 40-inch control section is mainly sandy loam, but it has few thin strata of loamy sand to silty clay. The profile is mildly alkaline or moderately alkaline.

Turner Series

The Turner series consists of deep, well drained soils on fans and terraces on uplands. These soils formed in outwash. Slopes range from 0 to 15 percent.

These soils are fine-loamy over sandy or sandy-skeletal, mixed Typic Argiborolls.

Typical pedon of Turner sandy loam, 0 to 2 percent slopes, 2,050 feet south and 320 feet east of the northwest corner of sec. 19, T. 30 N., R. 46 E.

A1—0 to 10 inches; dark brown (10YR 3/3) sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; many fine and medium roots; common fine tubular pores; 5 percent pebbles; noneffervescent; mildly alkaline; clear smooth boundary.

B2t—10 to 21 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; moderate medium angular and subangular blocky structure; hard, friable, sticky and nonplastic; many fine and medium roots; common fine and medium tubular pores; common moderately thick clay films on faces of peds, in pores, and as bridges between sand grains; 5 percent pebbles; noneffervescent; mildly alkaline; clear smooth boundary.

B3t—21 to 24 inches; light olive brown (2.5Y 5/4) loamy sand, olive brown (2.5Y 4/4) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common fine roots and few medium roots; few fine tubular pores; few thin clay films as bridges between sand grains; 7 percent pebbles; noneffervescent; mildly alkaline; abrupt smooth boundary.

C1ca—24 to 30 inches; grayish brown (2.5Y 5/2) sand, grayish brown (2.5Y 5/2) moist; single grain; loose, nonsticky and nonplastic; common fine roots; 3 percent pebbles; few masses of lime; violently effervescent; moderately alkaline; abrupt smooth boundary.

IIC2ca—30 to 60 inches; grayish brown (2.5Y 5/2) very gravelly sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose, nonsticky and nonplastic; few fine roots; 50 percent pebbles; many masses of lime on undersides of gravel; violently effervescent; moderately alkaline.

The mollic epipedon is 7 to 15 inches thick. Depth to the IIC horizon is 20 to 40 inches. The solum is 0 to 15 percent coarse fragments, of which 0 to 10 percent is pebbles and 0 to 5 percent is cobbles. The IIC horizon is 35 to 65 percent coarse fragments, of which 35 to 55 percent is pebbles and 0 to 10 percent is cobbles.

Vanda Variant

The Vanda Variant consists of deep, well drained soils on fans. These soils formed in alluvium. Slopes range from 4 to 10 percent.

These soils are fine, montmorillonitic (calcareous), frigid Ustic Torriorthents.

Typical pedon of a Vanda Variant in an area of Vanda Variant-Thebo-Lisam complex, 4 to 15 percent slopes, 300 feet west and 2,640 feet south of the northeast corner of sec. 2, T. 27 N., R. 47 E.

A11—0 to 2 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium granular structure; upper 1 inch has a vesicular crust; slightly hard, friable, sticky and plastic; many fine and medium roots; many fine tubular pores; slightly effervescent; moderately alkaline; abrupt smooth boundary.

A12—2 to 8 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate coarse subangular blocky structure; very hard, firm, sticky and plastic; common fine roots; many fine tubular pores and few medium tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C1cs—8 to 24 inches; light brownish gray (2.5Y 6/2) heavy silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, sticky and plastic; common fine roots; common fine tubular pores and few medium tubular pores; common fine, medium, and coarse soft gypsum masses; strongly effervescent; moderately alkaline; gradual smooth boundary.

C2cs—24 to 48 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, sticky and plastic; few fine roots; common fine tubular pores; common fine and medium soft gypsum masses; strongly effervescent; moderately alkaline; clear smooth boundary.

C3cs—48 to 60 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; few fine roots; common fine soft gypsum masses; strongly effervescent; moderately alkaline.

The profile is 0 to 5 percent coarse fragments, mainly pebbles. The lower part of the Ccs horizon is silty clay and clay. Salinity in the Ccs horizon is 4 to 8 millimhos per centimeter.

Wabek Series

The Wabek series consists of deep, excessively drained soils on outwash plains and terraces. These soils formed in outwash gravel. Slopes range from 8 to 45 percent.

These soils are sandy-skeletal, mixed Entic Haploborolls.

Typical pedon of a Wabek sandy loam in an area of Wabek-Tinsley complex, 8 to 15 percent slopes, 1,900 feet west and 400 feet south of the northeast corner of sec. 29, T. 35 N., R. 49 E.

A1—0 to 7 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; many fine roots and few medium roots; 6 percent pebbles; noneffervescent; mildly alkaline; abrupt smooth boundary.

C1ca—7 to 19 inches; pale brown (10YR 6/3) very gravelly sandy loam, brown (10YR 5/3) moist; massive; soft, very friable, slightly sticky and slightly plastic; common fine roots; few fine tubular pores; 55 percent pebbles; common soft medium masses of lime; violently effervescent; mildly alkaline; abrupt smooth boundary.

IIC2—19 to 33 inches; pale brown (10YR 6/3) gravelly sand, grayish brown (10YR 5/2) moist; single grain; loose, nonsticky and nonplastic; common fine roots; 25 percent pebbles; strongly effervescent; mildly alkaline; abrupt smooth boundary.

IIIC3—33 to 60 inches; pale brown (10YR 6/3) very gravelly sand, grayish brown (10YR 5/2) moist; single grain; loose, nonsticky and nonplastic; 55 percent pebbles; strongly effervescent; mildly alkaline.

The mollic epipedon is 7 to 10 inches thick. The A horizon is 5 to 15 percent coarse fragments. The 10- to 40-inch control section is 35 to 60 percent coarse fragments.

Williams Series

The Williams series consists of deep, well drained soils on glaciated uplands. These soils formed in glacial till. Slopes range from 0 to 8 percent.

These soils are fine-loamy, mixed Typic Argiborolls.

Typical pedon of Williams loam, 2 to 8 percent slopes, 2,400 feet south and 1,000 feet east of the northwest corner of sec. 24, T. 28 N., R. 53 E.

A1—0 to 3 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; moderate fine and medium platy and granular structure; slightly hard, friable, nonsticky and nonplastic; many fine and medium roots; common fine tubular pores; noneffervescent; mildly alkaline; clear smooth boundary.

B2t—3 to 12 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to strong medium angular blocky; very hard, firm, sticky and plastic; many fine roots along faces of peds; many fine tubular pores; many moderately thick clay films on faces of peds and in pores; 1 percent pebbles; noneffervescent; mildly alkaline; clear smooth boundary.

B3tca—12 to 31 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; hard, firm, sticky and plastic; common fine roots; common fine tubular pores; few thin grayish brown (10YR 5/2) clay films on faces of peds; 2 percent pebbles and cobbles; many soft medium masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

C1ca—31 to 42 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; few fine roots; common medium tubular pores and many fine tubular pores; 5 percent pebbles and cobbles; common soft medium masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

C2ca—42 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; few fine roots; many fine tubular pores; 5 percent pebbles and cobbles; common soft medium masses of lime; few soft threadlike seams of gypsum; violently effervescent; moderately alkaline.

The profile is neutral in the upper part and ranges to moderately alkaline in the lower part. The profile is 0 to 5 percent pebbles and 0 to 5 percent cobbles. The Cca horizon is clay loam to loam. Calcium carbonate equivalent in the Cca horizon is 6 to 10 percent.

Zahill Series

The Zahill series consists of deep, well drained soils on glaciated uplands. These soils formed in glacial till. Slopes range from 2 to 45 percent.

These soils are fine-loamy, mixed (calcareous), frigid Typic Ustorthents.

Typical pedon of a Zahill loam in an area of Zahill-Tinsley complex, 15 to 45 percent slopes, 2,290 feet

south and 450 feet west of the northeast corner of sec. 35, T. 28 N., R. 47 E.

A1—0 to 3 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots; few fine tubular pores; 5 percent pebbles; strongly effervescent; moderately alkaline; clear smooth boundary.

C1ca—3 to 22 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, sticky and plastic; common fine roots; many fine tubular pores and common medium tubular pores; 5 percent pebbles; many soft large masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

C2—22 to 33 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and plastic; common fine roots; common fine tubular pores; 5 percent pebbles; violently effervescent; moderately alkaline; clear smooth boundary.

C3—33 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and plastic; few fine roots; many fine tubular pores; 5 percent pebbles; few soft coarse gypsum crystals; strongly effervescent; moderately alkaline.

The profile is mildly alkaline or moderately alkaline. It is 0 to 15 percent coarse fragments, of which 0 to 10 percent is pebbles and 0 to 5 percent is cobbles. Calcium carbonate equivalent of the Cca horizon is 5 to 10 percent. The C horizon is clay loam to loam.

Zahl Series

The Zahl series consists of deep, well drained soils on glaciated uplands. These soils formed in glacial till. Slopes range from 2 to 15 percent.

These soils are fine-loamy, mixed Entic Haploborolls.

Typical pedon of Zahl loam, 2 to 8 percent slopes, 1,900 feet west and 250 feet south of the northeast corner of sec. 24, T. 29 N., R. 58 E.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine tubular pores; 2 percent rock fragments; strongly effervescent; mildly alkaline; abrupt smooth boundary.

C1ca—7 to 28 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; few fine tubular pores; 2 percent rock fragments; common soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

C2ca—28 to 35 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; few fine tubular pores; 10 percent rock fragments; common soft masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

C3ca—35 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; few fine tubular pores; 2 percent rock fragments; common soft masses of lime; violently effervescent; moderately alkaline.

The profile is 2 to 10 percent rock fragments. The A horizon is neutral or mildly alkaline. The C horizon is loam to clay loam and is mildly alkaline or moderately alkaline.

Formation of the Soils

Soil is composed of mineral matter mixed with varying amounts of organic matter derived mostly from vegetation. The mineral matter consists of parent material that has been weathered and broken down by the combined effects of climate, living organisms, and topography acting over long periods of time. Within short distances the combination of these factors varies, and consequently the soils that form differ in fertility, productivity, and physical and chemical characteristics.

Parent Material

Most of the soils in this survey area formed in place in glacial till underlain by shale or sandstone. Some of the soils formed in material derived from shale or weakly consolidated sedimentary beds, and some of the soils formed in alluvium derived from glacial till, shale, or sandstone. The alluvium was deposited in the major valleys and on some of the bordering uplands. The soils that formed in glacial till, such as those of the Williams series, generally are loamy or clayey, depending on the texture of the till. The soils that formed in material derived from shale, such as those of the Lisam series, are clayey. The soils that formed in material derived from weakly consolidated sedimentary beds, such as those of the Cabba series, are loamy. The soils that formed in alluvium derived from glacial till, sandstone, or shale, such as those of the Havrelon series, are loamy. Some of the soils in the area are saline and alkali because of the parent material.

Climate

Climate, an active force in the formation of soils, is determined mainly by temperature and precipitation. Erosion and alternate freezing and thawing break down bedrock. The weathered material is further broken down by chemical reactions such as solution and hydration. The precipitation and temperature affect the kind and amount of native vegetation that grows on the soil. Vegetation decays to produce organic matter in the soil. Soils that have cool temperatures and high precipitation generally contain more organic matter and are dark colored, and those that have warm temperatures and low precipitation generally contain less organic matter and are light colored. In this survey area, the average annual precipitation ranges from about 10 to 14 inches and the average annual temperature ranges from 40 to 45 degrees F.

Living Organisms

Living organisms are active in the formation of soils. The kinds of plants and animals present largely determine the kinds and amount of organic matter added to the soil and the way in which it is incorporated into the mineral material. Roots, rodents, and insects penetrate the soil and alter its structure. Leaves, roots, and entire plants that remain in the surface layer are changed to humus by micro-organisms, chemicals in the soil, and insects. Fungi and algae also contribute to the decomposition of bedrock.

The vegetation in this survey area is mainly short grasses, midgrasses, and shrubs. Common rodents are gophers, badgers, and rabbits. Pebbles and stones on the surface of terraces and in many other areas have been dug up by burrowing rodents.

Topography

Topography is determined by glaciation and the age and resistance of geologic formations to erosion by water and wind. On the eroded uplands of this survey area, runoff water has carved deep valleys. These rugged areas contrast sharply with the smooth areas of the terraces and flood plains of the river valleys.

On the uplands, the number and distinctness of soil horizons decrease as slope increases. Steep soils that have rapid runoff have many characteristics similar to those of soils that formed in arid climates. Nearly level to moderately sloping soils have the characteristics of soils that are most common in this survey area. Examples of this general principle are the Zahill soils that are moderately steep or steep and the Williams soils that are nearly level to moderately sloping. The Zahill soils do not have a B horizon, and the Williams soils do have a B horizon.

Time

The changes that take place in a soil over long periods of time are called soil genesis. Distinct horizons, or layers, develop in the soils as a result of these changes. The kinds and arrangement of these horizons

are the soil morphology, and they are described in terms of color, texture, structure, consistence, thickness, permeability, and chemistry.

Soils are classified as young to mature. The age of a soil is determined from the thickness of the A horizon, the content of organic matter and clay, the depth to which soluble material is leached, and the form and distribution of calcium carbonate and gypsum in the soil.

Lohler silty clay is an Entisol and is an example of a young soil. It is on a flood plain adjacent to a stream. The soil contains little organic matter, and it has no clay accumulation. Little translocation of carbonates has occurred in the soil.

The Turner soils formed in parent material that is similar to that of the Lohler silty clay but is much older. These soils formed in alluvium on uplands. They contain enough organic matter to have a dark colored A horizon. The Turner soils are an example of mature soils. They have a distinct clay accumulation in a B2t horizon, and nearly all of the carbonates have been leached to a depth of about 12 inches.

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(6) United States Department of Defense. 1968. Unified soil classification system for roads, airfields, embankments and foundations. MIL-STD-619 B, 30 pp., illus.

Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvial fan. The fanlike deposit of a stream where it issues from a gorge upon a plain or of a tributary stream near or at its junction with its main stream.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3.75
Low	3.75 to 5.0
Moderate	5.0 to 7.5
High	More than 7.5

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or arresting grazing for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diameter at breast height (DBH). Diameter of a tree measured at breast height (generally 4.5 feet above the ground). Unless otherwise specified, DBH includes the bark of the tree in the diameter measurement.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature; for example, fire that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Excess sodium (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravelly soil material. Material that is 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual.* The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky

structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water vpenetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Light textured soil. Sand and loamy sand.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and

biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse-grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential native plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same. (See climax vegetation.)

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This increases the vigor and reproduction of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, many wetlands, and areas that support certain forb and shrub communities.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a

distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Silviculture. Establishing, growing, and tending of forests.

Silvicultural system. Methods of harvesting trees that provide for the regeneration of desirable tree species, help to develop a desirable stand structure, and aid in insect and disease control. The application of a silvicultural system is determined by the kinds of trees a given soil supports, management objectives, and condition of the stands.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium absorption ratio (SAR) of a saturation extract, or the ratio of Na^+ to Ca^{++} + Mg^{++}. The degrees of sodicity are—

	SAR
Slight	Less than 13:1
Moderate	13-30:1
Strong	More than 30:1

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trafficability. The degree to which a soil is capable of supporting vehicular traffic under a wide range of soil moisture conditions.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.1 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
Recorded in the period 1951-78 at Bredette, Mont.											
January----	18.2	-3.2	7.5	46	-38	0	0.35	0.11	0.54	2	5.8
February---	26.1	4.7	15.4	52	-29	14	0.28	0.09	0.42	1	4.2
March------	36.1	14.1	25.1	67	-23	61	0.48	0.13	0.75	2	5.8
April------	53.6	28.8	41.3	83	3	159	0.89	0.34	1.34	3	3.2
May--------	67.0	40.2	53.6	91	20	426	1.86	0.55	2.92	5	0.5
June-------	75.9	48.6	62.3	97	34	669	2.86	1.40	4.11	7	0.0
July-------	83.8	53.5	68.7	102	39	890	1.55	0.78	2.22	5	0.0
August-----	83.2	51.4	67.3	101	35	846	1.73	0.47	2.74	4	0.0
September--	70.5	41.3	55.9	95	21	483	1.26	0.25	2.03	3	0.0
October----	58.5	30.9	44.7	84	8	202	0.57	0.11	0.92	2	1.4
November---	38.4	16.1	27.3	67	-15	35	0.28	0.10	0.41	1	3.6
December---	24.9	4.5	14.7	51	-35	19	0.34	0.18	0.47	1	5.7
Yearly:											
Average--	53.06	27.8	40.3	---	---	---	---	---	---	---	---
Extreme--	---	---	---	104	-39	---	---	---	---	---	---
Total	---	---	---	---	---	3,804	12.45	9.62	15.09	36	30.2

See footnote at end of table.

TABLE 1.--TEMPERATURE AND PRECIPITATION--Continued

Month	Temperature: Average daily maximum	Temperature: Average daily minimum	Temperature: Average daily	Temperature: 2 years in 10 will have-- Maximum temperature higher than--	Temperature: 2 years in 10 will have-- Minimum temperature lower than--	Temperature: Average number of growing degree days[1]	Precipitation: Average	Precipitation: 2 years in 10 will have-- Less than--	Precipitation: 2 years in 10 will have-- More than--	Precipitation: Average number of days with 0.1 inch or more	Precipitation: Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
Recorded in the period 1951-78 at Culbertson, Mont.											
January----	19.1	-4.3	7.4	49	-41	0	0.46	0.15	0.70	2	5.5
February---	27.8	3.8	15.8	54	-31	13	0.37	0.09	0.58	1	4.1
March------	38.7	13.5	26.1	71	-27	70	0.45	0.13	0.71	2	4.2
April------	56.7	28.1	42.4	84	5	153	1.31	0.35	2.07	3	2.1
May--------	69.3	39.4	54.3	93	20	443	2.31	0.71	3.60	6	0.0
June-------	77.9	48.6	63.3	97	33	699	3.06	1.56	4.35	7	0.0
July-------	85.7	52.7	69.2	104	37	905	1.90	0.88	2.76	5	0.0
August-----	85.0	50.3	67.7	103	33	859	1.57	0.52	2.42	4	0.0
September--	72.0	39.9	56.0	95	20	480	1.46	0.41	2.30	4	0.1
October----	60.2	29.3	44.8	87	8	205	0.82	0.17	1.33	2	0.9
November---	39.8	15.3	27.6	69	-15	37	0.40	0.13	0.63	2	3.1
December---	26.4	3.6	15.0	53	-35	21	0.42	0.20	0.61	2	5.1
Yearly:											
Average--	54.9	27.0	40.8	---	---	---	---	---	---	---	---
Extreme--	---	---	---	105	-41	---	---	---	---	---	---
Total	---	---	---	---	---	3,885	14.53	10.93	17.80	40	25.1

See footnote at end of table.

TABLE 1.--TEMPERATURE AND PRECIPITATION--Continued

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.1 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
Recorded in the period 1951-78 at Scobey, Mont.											
January---	18.7	-2.2	8.3	46	-35	11	0.52	0.13	0.82	2	8.6
February--	27.5	5.5	16.6	52	-26	14	0.46	0.07	0.75	1	7.5
March-----	37.0	14.4	25.7	65	-22	72	0.61	0.11	0.98	2	7.8
April-----	55.1	29.2	42.2	82	4	172	1.00	0.42	1.49	3	4.0
May-------	68.9	40.5	54.7	92	20	456	1.91	0.62	2.96	5	0.0
June------	77.3	49.4	63.4	96	34	702	2.90	1.47	4.14	7	0.0
July------	85.2	54.4	69.8	102	42	924	1.64	0.90	2.29	5	0.0
August----	84.1	52.1	68.2	100	36	874	1.67	0.56	2.58	4	0.0
September-	72.0	41.7	56.8	93	22	505	1.36	0.27	2.20	3	0.1
October---	59.7	32.0	45.8	84	10	234	0.57	0.07	0.95	2	0.0
November--	39.1	17.6	28.5	67	-13	47	0.46	0.11	0.73	2	1.8
December--	25.4	5.4	15.4	51	-33	21	0.60	0.20	0.92	2	5.8
Yearly:											
Average-	54.2	28.5	41.3	---	---	---	---	---	---	---	---
Extreme-	---	---	---	104	-35	---	---	---	---	---	---
Total---	---	---	---	---	---	4,031	13.70	10.32	16.83	38	35.6

See footnote at end of table.

TABLE 1.--TEMPERATURE AND PRECIPITATION--Continued

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.1 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
Recorded in the period 1951-73 at Wolf Point, Mont.											
January---	20.0	-5.0	7.5	50	-43	0	0.57	0.22	0.87	3	10.7
February--	27.8	2.2	15.0	53	-38	14	0.45	0.16	0.69	2	7.6
March-----	39.0	13.1	26.1	72	-28	89	0.54	0.17	0.84	2	5.9
April-----	57.0	27.9	42.5	84	5	158	1.23	0.34	1.94	3	4.0
May-------	70.9	39.4	55.2	94	19	471	1.76	0.59	2.71	5	0.1
June------	79.4	49.2	64.3	99	33	729	2.84	1.37	4.09	7	0.0
July------	87.5	53.3	70.5	105	38	946	2.00	0.77	3.03	5	0.0
August----	87.2	51.4	69.3	104	36	908	1.67	0.30	2.71	3	0.0
September-	73.9	40.9	57.4	97	20	522	0.97	0.22	1.56	3	0.1
October---	61.6	30.1	45.8	87	8	218	0.63	0.11	1.04	2	1.1
November--	41.6	17.0	29.4	70	-15	51	0.36	0.05	0.60	2	4.3
December--	28.0	4.3	16.1	55	-32	29	0.39	0.15	0.58	2	5.8
Yearly:											
Average-	56.2	27.4	41.6	---	---	---	---	---	---	---	---
Extreme-	---	---	---	106	-43	---	---	---	---	---	---
Total---	---	---	---	---	---	4,135	13.41	10.56	16.17	39	39.6

[1]A growing degree day is an index of the amount of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Recorded in the period 1951-78 at Bredette, Mont.			
Last freezing temperature in spring:			
1 year in 10 later than--	May 14	May 26	June 3
2 years in 10 later than--	May 9	May 20	May 29
5 years in 10 later than--	April 30	May 9	May 19
First freezing temperature in fall:			
1 year in 10 earlier than--	September 12	September 4	August 27
2 years in 10 earlier than--	September 19	September 10	September 2
5 years in 10 earlier than--	October 2	September 22	September 13
Recorded in the period 1951-78 at Culbertson, Mont.			
Last freezing temperature in spring:			
1 year in 10 later than--	May 15	June 1	June 8
2 years in 10 later than--	May 10	May 27	June 3
5 years in 10 later than--	May 2	May 16	May 24
First freezing temperature in fall:			
1 year in 10 earlier than--	September 7	September 6	August 29
2 years in 10 earlier than--	September 14	September 10	September 2
5 years in 10 earlier than--	September 26	September 17	September 11

TABLE 2.--FREEZE DATES IN SPRING AND FALL--Continued

Probability	Temperature 24° F or lower	28° F or lower	32° F or lower
Recorded in the period 1951-78 at Scobey, Mont.			
Last freezing temperature in spring:			
1 year in 10 later than--	May 17	May 25	June 2
2 years in 10 later than--	May 11	May 19	May 28
5 years in 10 later than--	April 30	May 7	May 17
First freezing temperature in fall:			
1 year in 10 earlier than--	September 19	September 5	August 29
2 years in 10 earlier than--	September 25	September 12	September 3
5 years in 10 earlier than--	October 7	September 25	September 14
Recorded in the period 1951-73 at Wolf Point, Mont.			
Last freezing temperature in spring:			
1 year in 10 later than--	May 18	May 25	June 5
2 years in 10 later than--	May 12	May 21	May 31
5 years in 10 later than--	May 1	May 12	May 22
First freezing temperature in fall:			
1 year in 10 earlier than--	September 13	September 6	August 31
2 years in 10 earlier than--	September 19	September 11	September 4
5 years in 10 earlier than--	October 1	September 21	September 11

TABLE 3.--GROWING SEASON

Probability	Length of growing season if daily minimum temperature exceeds--		
	24° F	28° F	32° F
	Days	Days	Days
Recorded in the period 1951-78 at Bredette, Mont.			
9 years in 10	132	113	89
8 years in 10	139	120	99
5 years in 10	155	135	117
2 years in 10	170	149	135
1 year in 10	177	156	145
Recorded in the period 1951-78 at Culbertson, Mont.			
9 years in 10	125	106	85
8 years in 10	132	112	93
5 years in 10	147	123	109
2 years in 10	161	135	125
1 year in 10	169	141	133
Recorded in the period 1951-78 at Scobey, Mont.			
9 years in 10	131	113	97
8 years in 10	141	122	104
5 years in 10	159	140	119
2 years in 10	178	158	133
1 year in 10	188	168	141
Recorded in the period 1951-73 at Wolf Point, Mont.			
9 years in 10	127	111	95
8 years in 10	136	118	101
5 years in 10	151	132	112
2 years in 10	167	145	122
1 year in 10	175	152	128

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Roosevelt County	Daniels County	Total--	
				Area	Extent
		Acres	Acres	Acres	Pct
1	Adger silty clay loam, 1 to 8 percent slopes	3,860	740	4,600	0.2
2	Adger-Farnuf complex, 1 to 8 percent slopes	10,960	4,090	15,050	0.6
3	Adger-Nobe complex, 1 to 4 percent slopes	4,840	2,550	7,390	0.3
4	Badland	10,580	150	10,730	0.4
5	Banks loam, 0 to 2 percent slopes	3,170	80	3,250	0.1
6	Blanchard loamy fine sand, 4 to 25 percent slopes	7,880	230	8,110	0.3
7	Bowbells silt loams, 0 to 4 percent slopes	12,540	5,830	18,370	0.7
8	Bowdoin clay, protected, 0 to 2 percent slopes	4,670	---	4,670	0.2
9	Cabba-Cambert silt loams, 15 to 45 percent slopes	17,420	14,730	32,150	1.3
10	Cabba-Cambert-Cherry silt loams, 8 to 15 percent slopes	22,020	30,150	52,170	2.1
11	Cabba-Cambert-Rock outcrop complex, 15 to 45 percent slopes	23,490	6,440	29,930	1.2
12	Cherry silt loam, 2 to 8 percent slopes	19,760	18,540	38,300	1.6
13	Dimmick silty clay, 0 to 1 percent slopes	840	480	1,320	0.1
14	Dooley sandy loam, 0 to 4 percent slopes	82,620	10,360	92,980	3.8
15	Evanston loam, 2 to 8 percent slopes	1,590	---	1,590	0.1
16	Farland silt loam, 2 to 8 percent slopes	13,930	28,930	42,860	1.7
17	Farland-Cherry silt loams, 2 to 8 percent slopes	34,260	75,140	109,400	4.5
18	Farnuf loam, 2 to 8 percent slopes	55,940	35,140	91,080	3.7
19	Fluvaquents, ponded, 0 to 1 percent slopes	6,060	700	6,760	0.3
20	Fluvaquents, saline, 0 to 2 percent slopes	9,420	3,500	12,920	0.5
21	Glendive fine sandy loam, protected, 0 to 2 percent slopes	850	---	850	*
22	Grail silty clay loam, 0 to 4 percent slopes	9,540	1,500	11,040	0.5
23	Harlem silty clay loam, protected, 0 to 2 percent slopes	6,760	---	6,760	0.3
24	Havre silt loam, protected, 0 to 2 percent slopes	2,110	---	2,110	0.1
25	Havre-Glendive complex, protected, 0 to 2 percent slopes	2,140	---	2,140	0.1
26	Havrelon loam, 0 to 2 percent slopes	7,250	4,310	11,560	0.5
27	Havrelon silt loam, protected, 0 to 2 percent slopes	17,970	---	17,970	0.7
28	Havrelon-Trembles complex, 0 to 2 percent slopes	12,200	5,980	18,180	0.7
29	Havrelon-Trembles complex, protected, 0 to 2 percent slopes	15,320	---	15,320	0.6
30	Hillon loam, 8 to 15 percent slopes	2,400	---	2,400	0.1
31	Hillon loam, 15 to 45 percent slopes	2,930	---	2,930	0.1
32	Hillon-Tinsley complex, 8 to 15 percent slopes	3,070	---	3,070	0.1
33	Hillon-Tinsley complex, 15 to 45 percent slopes	7,000	---	7,000	0.3
34	Lallie silty clay, saline, 0 to 2 percent slopes	20,380	1,300	21,680	0.9
35	Lihen sandy loam, 2 to 8 percent slopes	4,600	5,170	9,770	0.4
36	Lohler silty clay, 0 to 2 percent slopes	8,130	620	8,750	0.4
37	Lohler silty clay, protected, 0 to 2 percent slopes	24,670	---	24,670	1.0
38	Martinsdale loam, 1 to 8 percent slopes	9,180	6,890	16,070	0.7
39	McKenzie clay loam, 0 to 2 percent slopes	3,180	1,770	4,950	0.2
40	Nishon clay loam, 0 to 2 percent slopes	2,240	880	3,120	0.1
41	Nobe silty clay, flooded, 0 to 2 percent slopes	4,910	8,180	13,090	0.5
42	Parshall sandy loam, 0 to 4 percent slopes	7,220	1,590	8,810	0.4
43	Parshall sandy loam, silty substratum, 0 to 4 percent slopes	10,140	1,160	11,300	0.5
44	Phillips-Elloam clay loams, 2 to 8 percent slopes	16,980	---	16,980	0.7
45	Riverwash	3,200	390	3,590	0.2
46	Savage clay loam, 2 to 8 percent slopes	5,160	2,050	7,210	0.3
47	Tally sandy loam, 2 to 8 percent slopes	14,730	21,320	36,050	1.5
48	Tally sandy loam, 8 to 15 percent slopes	3,710	1,600	5,310	0.2
49	Tally-Lihen sandy loams, 1 to 8 percent slopes	8,990	28,040	37,030	1.5
50	Telstad loam, 2 to 8 percent slopes	2,070	---	2,070	0.1
51	Telstad-Hillon loams, 2 to 8 percent slopes	15,900	---	15,900	0.6
52	Thebo-Lisam complex, 15 to 45 percent slopes	3,170	---	3,170	0.1
53	Tinsley very gravelly sandy loam, 15 to 45 percent slopes	3,630	1,650	5,280	0.2
54	Trembles fine sandy loam, 0 to 2 percent slopes	4,110	870	4,980	0.2
55	Trembles fine sandy loam, protected, 0 to 2 percent slopes	2,140	---	2,140	0.1
56	Turner sandy loam, 0 to 2 percent slopes	7,140	10,310	17,450	0.7
57	Turner sandy loam, 2 to 8 percent slopes	54,030	108,790	162,820	6.6
58	Turner-Beaverton complex, 2 to 8 percent slopes	11,650	74,380	86,030	3.5
59	Turner-Beaverton complex, 8 to 15 percent slopes	9,410	28,000	37,410	1.5
60	Typic Fluvaquents, 0 to 2 percent slopes	10,180	10,710	20,890	0.9
61	Typic Ustifluvents, 0 to 2 percent slopes	26,880	25,850	52,730	2.2
62	Ustic Torrifluvents, 0 to 2 percent slopes	2,870	---	2,870	0.1
63	Ustifluvents, saline, 0 to 2 percent slopes	7,530	11,620	19,150	0.8
64	Vanda Variant silty clay, 4 to 10 percent slopes	1,870	---	1,870	0.1
65	Vanda Variant-Thebo-Lisam complex, 4 to 15 percent slopes	3,320	10	3,330	0.2
66	Wabek-Cabba-Tinsley complex, 15 to 45 percent slopes	1,370	26,010	27,380	1.1

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Roosevelt County	Daniels County	Total--	
				Area	Extent
		Acres	Acres	Acres	Pct
67	Wabek-Tinsley complex, 8 to 15 percent slopes	940	16,170	17,110	0.7
68	Williams loam, 0 to 2 percent slopes	17,300	4,410	21,710	0.9
69	Williams loam, 2 to 8 percent slopes	81,940	73,800	155,740	6.4
70	Williams-Zahill loams, 2 to 8 percent slopes	355,990	120,100	476,090	19.4
71	Zahill loam, 8 to 15 percent slopes	100,720	37,230	137,950	5.6
72	Zahill loam, 15 to 45 percent slopes	58,240	13,280	71,520	2.9
73	Zahill-Cabba-Cambert complex, 8 to 15 percent slopes	10,960	8,450	19,410	0.8
74	Zahill-Cabba-Cambert complex, 15 to 45 percent slopes	38,410	16,440	54,850	2.2
75	Zahill-Tinsley complex, 8 to 15 percent slopes	19,440	1,430	20,870	0.9
76	Zahill-Tinsley complex, 15 to 45 percent slopes	70,860	3,060	73,920	3.0
77	Zahl loam, 2 to 8 percent slopes	7,250	40	7,290	0.3
78	Zahl loam, 8 to 15 percent slopes	11,600	30	11,630	0.5
	Water	2,670	350	3,020	0.1
	Total	1,526,400	923,520	2,449,920	100.0

*Less than 0.05 percent.

TABLE 5.--YIELDS PER ACRE OF CROPS

[Yields in the N columns are for nonirrigated soils; those in the I columns are for irrigated soils. Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. Only the soils suited to crops are listed]

Soil name and map symbol	Winter wheat		Spring wheat		Barley		Alfalfa hay		Grass-legume hay		Grass hay	
	N	I	N	I	N	I	N	I	N	I	N	I
	Bu	Bu	Bu	Bu	Bu	Bu	Ton	Ton	Ton	Ton	Ton	Ton
5 Banks	---	---	---	---	---	---	---	---	0.8	---	---	---
7 Bowbells-Bowbells	43	---	38	---	55	---	---	---	---	---	2.0	---
10 Cabba-Cambert-Cherry	---	---	12	---	21	---	---	---	---	---	---	---
12 Cherry	---	---	30	---	42	---	---	---	1.7	---	---	---
14 Dooley	34	---	30	---	45	---	---	---	---	---	1.4	---
15 Evanston	---	---	28	---	43	---	---	---	---	---	---	---
16 Farland	---	---	34	---	49	---	---	---	---	---	---	---
17 Farland-Cherry	---	---	32	---	45	---	---	---	1.9	---	---	---
18 Farnuf	---	---	34	---	49	---	---	---	---	---	---	---
21 Glendive	25	---	22	40	35	---	1.5	4.0	---	---	---	---
22 Grail	---	---	37	---	52	---	---	---	---	---	1.8	---
23 Harlem	35	---	30	42	42	60	1.9	5.0	---	4.0	---	---
24 Havre	---	---	35	47	50	---	2.4	5.0	---	---	---	---
25 Havre-Glendive	---	---	30	40	45	---	2.1	4.7	---	---	---	---
26 Havrelon	---	---	36	---	50	---	---	---	2.0	---	---	---
27 Havrelon	40	---	36	45	50	70	2.5	5.2	---	---	2.0	---
28 Havrelon-Trembles	---	---	30	---	45	---	---	---	---	---	1.8	---
29 Havrelon-Trembles	38	---	32	43	47	---	2.2	4.8	---	---	1.7	---
30 Hillon	---	---	16	---	---	---	---	---	---	---	---	---
32 Hillon-Tinsley	---	---	14	---	27	---	---	---	---	---	---	---

TABLE 5.--YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Winter wheat		Spring wheat		Barley		Alfalfa hay		Grass-legume hay		Grass hay	
	N	I	N	I	N	I	N	I	N	I	N	I
	Bu	Bu	Bu	Bu	Bu	Bu	Ton	Ton	Ton	Ton	Ton	Ton
34 Lallie	---	---	---	---	---	---	---	---	---	1.0	---	---
35 Lihen	---	---	13	---	25	---	---	---	---	---	---	---
36 Lohler	---	---	30	---	42	---	---	---	---	---	1.6	---
37 Lohler	---	---	30	---	42	---	2.0	5.0	---	4.0	1.5	---
38 Martinsdale	---	---	35	---	50	---	---	---	---	---	---	---
39 McKenzie	---	---	---	---	---	---	---	---	---	---	2.0	---
40 Nishon	---	---	33	---	45	---	---	---	---	---	2.0	---
42 Parshall	---	---	35	---	50	---	---	---	---	---	1.9	---
43 Parshall	---	---	40	---	58	---	---	---	---	---	2.5	---
44 Phillips-Elloam	---	---	20	---	33	---	---	---	---	---	---	---
46 Savage	38	---	30	---	47	---	---	---	---	---	---	---
47 Tally	---	---	22	---	38	---	---	---	---	---	---	---
48 Tally	---	---	18	---	---	---	---	---	---	---	1.4	---
49 Tally-Lihen	---	---	17	---	29	---	---	---	---	---	---	---
50 Telstad	36	---	28	---	42	---	---	---	---	---	---	---
51 Telstad-Hillon	33	---	25	---	40	---	---	---	---	---	---	---
54 Trembles	30	---	22	---	38	---	---	---	---	---	---	---
55 Trembles	30	---	22	---	38	---	1.5	4.0	---	---	---	---
56 Turner	---	---	22	---	38	---	1.8	---	1.5	---	---	---
57 Turner	---	---	20	---	34	---	1.7	---	1.4	---	---	---
58 Turner-Beaverton	---	---	18	---	29	---	---	---	---	---	---	---
59 Turner-Beaverton	---	---	12	---	---	---	---	---	---	---	---	---

TABLE 5.--YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Winter wheat		Spring wheat		Barley		Alfalfa hay		Grass-legume hay		Grass hay	
	N	I	N	I	N	I	N	I	N	I	N	I
	Bu	Bu	Bu	Bu	Bu	Bu	Ton	Ton	Ton	Ton	Ton	Ton
68 Williams	39	---	35	---	50	---	---	---	2.0	---	---	---
69 Williams	37	---	33	---	48	---	---	---	1.8	---	---	---
70 Williams-Zahill	31	---	27	---	42	---	---	---	1.6	---	---	---
71 Zahill	---	---	17	---	25	---	---	---	---	---	---	---
73 Zahill-Cabba-Cambert	---	---	14	---	20	---	---	---	---	---	---	---
75 Zahill-Tinsley	---	---	14	---	20	---	---	---	---	---	---	---
77 Zahl	---	---	22	---	35	---	---	---	1.5	---	---	---

TABLE 6.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
1 Adger	Severe: excess sodium, excess salt.	Severe: excess sodium, excess salt.	Severe: excess sodium, excess salt.	Severe: erodes easily.
2*: Adger	Severe: excess sodium, excess salt.	Severe: excess sodium, excess salt.	Severe: excess sodium, excess salt.	Severe: erodes easily.
Farnuf	Slight	Slight	Moderate: slope, small stones.	Severe: erodes easily.
3*: Adger	Severe: excess sodium, excess salt.	Severe: excess sodium, excess salt.	Severe: excess sodium, excess salt.	Severe: erodes easily.
Nobe	Severe: excess salt.	Severe: excess salt.	Severe: excess salt.	Severe: erodes easily.
4*. Badland				
5 Banks	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.
6 Blanchard	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
7*: Bowbells	Slight	Slight	Moderate: slope.	Severe: erodes easily.
Bowbells	Slight	Slight	Moderate: slope.	Severe: erodes easily.
8 Bowdoin	Severe: excess salt.	Severe: excess salt.	Severe: excess salt.	Severe: erodes easily.
9*: Cabba	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.
Cambert	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.
10*: Cabba	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.
Cambert	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.
Cherry	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.
11*: Cabba	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
11*:				
Cambert	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.
Rock outcrop.				
12 Cherry	Slight	Slight	Moderate: slope.	Severe: erodes easily.
13 Dimmick	Severe: ponding, percs slowly, too clayey.	Severe: ponding, too clayey, percs slowly.	Severe: too clayey, ponding, percs slowly.	Severe: ponding, too clayey.
14 Dooley	Slight	Slight	Moderate: slope, small stones.	Slight.
15 Evanston	Slight	Slight	Moderate: slope.	Severe: erodes easily.
16 Farland	Slight	Slight	Moderate: slope.	Slight.
17*:				
Farland	Slight	Slight	Moderate: slope.	Slight.
Cherry	Slight	Slight	Moderate: slope.	Severe: erodes easily.
18 Farnuf	Slight	Slight	Moderate: slope, small stones.	Severe: erodes easily.
19*, 20*. Fluvaquents				
21 Glendive	Slight	Slight	Slight	Slight.
22 Grail	Slight	Slight	Moderate: slope.	Severe: erodes easily.
23 Harlem	Slight	Slight	Slight	Slight.
24 Havre	Slight	Slight	Slight	Slight.
25*:				
Havre	Slight	Slight	Slight	Slight.
Glendive	Slight	Slight	Slight	Slight.
26 Havrelon	Severe: flooding.	Slight	Moderate: flooding.	Slight.
27 Havrelon	Slight	Slight	Slight	Slight.
28*:				
Havrelon	Severe: flooding.	Slight	Moderate: flooding.	Slight.
Trembles	Severe: flooding.	Slight	Moderate: flooding.	Slight.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
29*:				
Havrelon	Slight	Slight	Slight	Slight.
Trembles	Slight	Slight	Slight	Slight.
30 Hillon	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.
31 Hillon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.
32*:				
Hillon	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.
Tinsley	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.
33*:				
Hillon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.
Tinsley	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.
34 Lallie	Severe: ponding, too clayey, excess salt.	Severe: ponding, too clayey, excess salt.	Severe: too clayey, ponding, excess salt.	Severe: ponding, too clayey.
35 Lihen	Slight	Slight	Moderate: slope.	Slight.
36 Lohler	Severe: flooding.	Moderate: too clayey.	Moderate: too clayey, flooding.	Moderate: too clayey.
37 Lohler	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
38 Martinsdale	Slight	Slight	Moderate: slope.	Severe: erodes easily.
39 McKenzie	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, erodes easily.
40 Nishon	Severe: ponding, percs slowly.	Severe: ponding, precs slowly.	Severe: ponding, percs slowly.	Severe: ponding, erodes easily.
41 Nobe	Severe: flooding, excess salt.	Severe: excess salt.	Severe: excess salt, too clayey.	Severe: erodes easily.
42, 43 Parshall	Slight	Slight	Moderate: slope.	Slight.
44*:				
Phillips	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Severe: erodes easily.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
44*:				
Elloam	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Severe: erodes easily.
45*. Riverwash				
46 Savage	Slight	Slight	Moderate: slope.	Severe: erodes easily.
47 Tally	Slight	Slight	Moderate: slope, small stones.	Slight.
48 Tally	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
49*:				
Tally	Slight	Slight	Moderate: slope, small stones.	Slight.
Lihen	Slight	Slight	Moderate: slope.	Slight.
50 Telstad	Slight	Slight	Moderate: slope, small stones.	Severe: erodes easily.
51*:				
Telstad	Slight	Slight	Moderate: slope, small stones.	Severe: erodes easily.
Hillon	Slight	Slight	Moderate: slope, small stones.	Severe: erodes easily.
52*:				
Thebo	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.
Lisam	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.
53 Tinsley	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.
54 Trembles	Severe: flooding.	Slight	Moderate: flooding.	Slight.
55 Trembles	Slight	Slight	Slight	Slight.
56 Turner	Slight	Slight	Moderate: small stones.	Slight.
57 Turner	Slight	Slight	Moderate: slope, small stones.	Slight.
58*:				
Turner	Slight	Slight	Moderate: slope, small stones.	Slight.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
58*:				
Beaverton	Severe: large stones.	Severe: large stones.	Severe: large stones, small stones.	Moderate: large stones.
59*:				
Turner	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Beaverton	Severe: large stones.	Severe: large stones.	Severe: large stones, slope, small stones.	Moderate: large stones.
60*. Typic Fluvaquents				
61*. Typic Ustifluvents				
62*. Ustic Torrifluvents				
63*. Ustifluvents				
64 Vanda Variant	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Severe: slope.	Severe: erodes easily.
65*:				
Vanda Variant	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Severe: slope.	Severe: erodes easily.
Thebo	Moderate: slope, percs slowly, too clayey.	Moderate: slope, too clayey, percs slowly.	Severe: slope.	Severe: erodes easily.
Lisam	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Serere: erodes easily.
66*:				
Wabek	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Cabba	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.
Tinsley	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.
67*:				
Wabek	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Tinsley	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.
68 Williams	Slight	Slight	Slight	Severe: erodes easily.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
69 Williams	Slight	Slight	Moderate: slope.	Severe: erodes easily.
70*:				
Williams	Slight	Slight	Moderate: slope.	Severe: erodes easily.
Zahill	Slight	Slight	Moderate: slope, small stones.	Severe: erodes easily.
71 Zahill	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.
72 Zahill	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.
73*:				
Zahill	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.
Cabba	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.
Cambert	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.
74*:				
Zahill	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.
Cabba	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.
Cambert	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.
75*:				
Zahill	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.
Tinsley	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.
76*:				
Zahill	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.
Tinsley	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.
77 Zahl	Slight	Slight	Moderate: slope.	Severe: erodes easily.
78 Zahl	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1-----------------Adger	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: excess salt, excess sodium.
2*:						
Adger------------	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: excess salt, excess sodium.
Farnuf-----------	Slight---------	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell.	Slight.
3*:						
Adger------------	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: excess salt, excess sodium.
Nobe-------------	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: excess salt, too clayey.
4*. Badland						
5-----------------Banks	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
6-----------------Blanchard	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
7*:						
Bowbells---------	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Bowbells---------	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
8-----------------Bowdoin	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: excess salt, too clayey.
9*:						
Cabba------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, thin layer.
Cambert----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
10*:						
Cabba------------	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Severe: thin layer.
Cambert----------	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, frost action.	Moderate: slope, thin layer.
Cherry-----------	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate; shrink-swell, slope.	Severe: slope.	Severe: low strength.	Moderate: slope.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
11*:						
Cabba	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, thin layer.
Cambert	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.						
12 Cherry	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
13 Dimmick	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, shrink-swell.	Severe: ponding, too clayey.
14 Dooley	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
15 Evanston	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.	Slight.
16 Farland	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
17*:						
Farland	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Cherry	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
18 Farnuf	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell.	Slight.
19*, 20*. Fluvaquents						
21 Glendive	Slight	Slight	Slight	Slight	Slight	Slight.
22 Grail	Moderate: too clayey.	Swvere: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
23 Harlem	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
24 Havre	Slight	Slight	Slight	Slight	Moderate: low strength.	Slight.
25*:						
Havre	Slight	Slight	Slight	Slight	Moderate: low strength.	Slight.
Glendive	Slight	Slight	Slight	Slight	Slight	Slight.
26 Havrelon	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
27 Havrelon	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength.	Slight.
28*:						
Havrelon	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Trembles	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
29*:						
Havrelon	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength.	Slight.
Trembles	Slight	Slight	Slight	Slight	Moderate: frost action.	Slight.
30 Hillon	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
31 Hillon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
32*:						
Hillon	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Tinsley	Severe: cutbanks cave.	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: slope, large stones.	Severe: small stones, droughty.
33*:						
Hillon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Tinsley	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, droughty, slope.
34 Lallie	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, frost action.	Severe: excess salt, ponding, too clayey.
35 Lihen	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
36 Lohler	Moderate: too clayey, flooding.	Severe: shrink-swell, flooding.	Severe: shrink-swell, flooding.	Severe: shrink-swell, flooding.	Severe: low strength, shrink-swell, flooding.	Severe: too clayey.
37 Lohler	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
38 Martinsdale	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell.	Slight.
39 McKenzie	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, shrink-swell.	Severe: ponding.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
40----------------- Nishon	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, shrink-swell.	Severe: ponding.
41----------------- Nobe	Moderate: too clayey, flooding.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, flooding, shrink-swell.	Severe: excess salt, too clayey.
42----------------- Parshall	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.
43----------------- Parshall	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Moderate: frost action.	Slight.
44*:						
Phillips---------	Moderate: dense layer.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Elloam-----------	Moderate: dense layer.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: excess salt.
45*. Riverwash						
46----------------- Savage	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
47----------------- Tally	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Slight.
48----------------- Tally	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
49*:						
Tally------------	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Slight.
Lihen------------	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.
50----------------- Telstad	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
51*:						
Telstad----------	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Hillon-----------	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
52*:						
Thebo------------	Severe: slope, cutbanks cave.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope, too clayey.
Lisam------------	Severe: slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope, thin layer, too clayey.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
53 Tinsley	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, droughty, slope.
54 Trembles	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
55 Trembles	Slight	Slight	Slight	Slight	Moderate: frost action.	Slight.
56 Turner	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Moderate: frost action.	Moderate: droughty.
57 Turner	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Moderate: frost action.	Moderate: droughty.
58*: Turner	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Moderate: frost action.	Moderate: droughty.
Beaverton	Severe: cutbanks cave.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones, slope.	Moderate: large stones.	Severe: large stones, droughty.
59*: Turner	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: droughty, slope.
Beaverton	Severe: cutbanks cave.	Moderate: large stones.	Moderate: large stones.	Severe: slope.	Moderate: large stones.	Severe: large stones, droughty.
60*. [illegible]nic Fluvaquents						
62[illegible] Us[illegible] To[illegible]						
63*. Ustifluv[illegible]						
64 Vanda Variant	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
65*: Vanda Variant	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
Thebo	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Severe: too clayey.
Lisam	Moderate: slope.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Severe: thin layer, too clayey.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
66*:						
Wabek	Severe: slope, cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Cabba	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, thin layer.
Tinsley	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, droughty, slope.
67*:						
Wabek	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope, droughty.
Tinsley	Severe: cutbanks cave.	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: slope, large stones.	Severe: small stones, droughty.
68 Williams	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
69 Williams	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
70*:						
Williams	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Zahill	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
71 Zahill	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
72 Zahill	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
73*:						
Zahill	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Cabba	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Severe: thin layer.
Cambert	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: shrink-swell, slope, frost action.	Moderate: slope, thin layer.
74*:						
Zahill	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
Cabba	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, thin layer.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
74*:						
Cambert----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
75*:						
Zahill-----------	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Tinsley----------	Severe: cutbanks cave.	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: slope, large stones.	Severe: small stones, droughty.
76*:						
Zahill-----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
Tinsley----------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, droughty, slope.
77---------------- Zahl	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
78---------------- Zahl	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1. Adger	Severe: percs slowly.	Moderate: slope.	Severe: too clayey, excess sodium, excess salt.	Slight	Poor: too clayey, hard to pack, excess salt.
2*:					
Adger	Severe: percs slowly.	Moderate: slope.	Severe: too clayey, excess sodium, excess salt.	Slight	Poor: too clayey, hard to pack, excess salt.
Farnuf	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, small stones.
3*:					
Adger	Severe: percs slowly.	Moderate: slope.	Severe: too clayey, excess sodium, excess salt.	Slight	Poor: too clayey, hard to pack, excess salt.
Nobe	Severe: percs slowly.	Moderate: slope.	Severe: excess salt, too clayey.	Slight	Poor: hard to pack, excess salt, too clayey.
4*. Badland					
5. Banks	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.
6. Blanchard	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy.
7*:					
Bowbells	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Bowbells	Severe: percs slowly.	Severe: seepage.	Severe: seepage.	Slight	Fair: too clayey.
8. Bowdoin	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: hard to pack, too clayey.
9*:					
Cabba	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: area reclaim, slope.
Cambert	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: area reclaim, slope.
10*:					
Cabba	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Poor: area reclaim.
Cambert	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Poor: area reclaim.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
10*:					
Cherry	Severe: percs slowly.	Severe: slope.	Moderate: too clayey, slope.	Moderate: slope.	Fair: too clayey, slope.
11*:					
Cabba	Severe: precs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: area reclaim, slope.
Cambert	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: area reclaim, slope.
Rock outcrop					
12 Cherry	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
13 Dimmick	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
14 Dooley	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
15 Evanston	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
16 Farland	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
17*:					
Farland	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Cherry	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
18 Farnuf	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, small stones.
19*, 20*. Fluvaquents					
21 Glendive	Slight	Severe: seepage.	Moderate: too sandy.	Severe: seepage.	Fair: too sandy.
22 Grail	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
23 Harlem	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: hard to pack, too clayey.
24 Havre	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
25*:					
Havre	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Glendive	Slight	Severe: seepage.	Moderate: too sandy.	Severe: seepage.	Fair: too sandy.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
26: Havrelon	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
27: Havrelon	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
28*:					
Havrelon	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
Trembles	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Fair: too sandy.
29*:					
Havrelon	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Trembles	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy.
30: Hillon	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.
31: Hillon	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
32*:					
Hillon	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.
Tinsley	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
33*:					
Hillon	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Tinsley	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
34: Lallie	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
35: Lihen	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: too sandy.
36: Lohler	Severe: percs slowly, flooding.	Severe: flooding.	Severe: too clayey. flooding,	Severe: flooding.	Poor: too clayey, hard to pack.
37: Lohler	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
38: Martinsdale	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
39----------------- McKenzie	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
40----------------- Nishon	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
41----------------- Nobe	Severe: flooding, percs slowly.	Severe: flooding.	Severe: flooding, excess salt, too clayey.	Severe: flooding.	Poor: hard to pack, too clayey, excess salt.
42----------------- Parshall	Slight-----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy.
43----------------- Parshall	Severe: wetness, percs slowly.	Severe: seepage.	Moderate: wetness, too sandy.	Severe: seepage.	Fair: too sandy.
44*:					
Phillips-----------	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Elloam-------------	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
45*. Riverwash					
46----------------- Savage	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey.
47----------------- Tally	Slight-----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy.
48----------------- Tally	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: too sandy, slope.
49*:					
Tally--------------	Slight-----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy.
Lihen--------------	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: too sandy.
50----------------- Telstad	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
51*:					
Telstad------------	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Hillon-------------	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
52*:					
Thebo--------------	Severe: depth to rock, percs slowly, slope.	Severe: seepage, slope.	Severe: slope, too clayey.	Severe: slope.	Poor: area reclaim, hard to pack, slope.
Lisam--------------	Severe: depth to rock, slope, percs slowly.	Severe: seepage, slope.	Severe: slope, too clayey.	Severe: slope.	Poor: area reclaim, hard to pack, slope.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
53 Tinsley	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
54 Trembles	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Fair: too sandy.
55 Trembles	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy.
56, 57 Turner	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
58*:					
Turner	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Beaverton	Severe: poor filter.	Severe: seepage, large stones.	Severe: seepage, too sandy, large stones.	Severe: seepage.	Poor: seepage, too sandy, small stones.
59*:					
Turner	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Beaverton	Severe: poor filter.	Severe: seepage, slope, large stones.	Severe: seepage, too sandy, large stones.	Severe: seepage.	Poor: seepage, too sandy, small stones.
60*. Typic Fluvaquents					
61*. Typic Ustifluvents					
62*. Ustic Torrifluvents					
63*. Ustifluvents					
64 Vanda Variant	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
65*:					
Vanda Variant	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Thebo	Severe: depth to rock, percs slowly.	Severe: seepage, slope.	Severe: too clayey.	Moderate: slope.	Poor: area reclaim, hard to pack, too clayey.
Lisam	Severe: depth to rock, percs slowly.	Severe: seepage, slope.	Severe: too clayey.	Moderate: slope.	Poor: area reclaim, hard to pack, too clayey.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
66*:					
Wabek	Severe: slope, poor filter.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: too sandy, seepage, small stones.
Cabba	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: area reclaim, slope.
Tinsley	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
67*:					
Wabek	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy, seepage.	Severe: seepage.	Poor: too sandy, seepage, small stones.
Tinsley	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
68 Williams	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
69 Williams	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
70*:					
Williams	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Zahill	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
71 Zahill	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
72 Zahill	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
73*:					
Zahill	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Cabba	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Poor: area reclaim.
Cambert	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Poor: area reclaim.
74*:					
Zahill	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Cabba	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: area reclaim, slope.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
74*:					
Cambert	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: area reclaim. slope.
75*:					
Zahill	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Tinsley	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
76*:					
Zahill	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Tinsley	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
77 Zahl	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
78 Zahl	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1 Adger	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
2*: Adger	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
Farnuf	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
3*: Adger	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
Nobe	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt.
4*. Badland				
5 Banks	Good	Probable	Improbable: too sandy.	Poor: too sandy.
6 Blanchard	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
7*: Bowbells	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Bowbells	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
8 Bowdoin	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt.
9*: Cabba	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer, slope.
Cambert	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
10*: Cabba	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer.
Cambert	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, area reclaim.
Cherry	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
11*:				
Cabba	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer, slope.
Cambert	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Rock outcrop.				
12 Cherry	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
13 Dimmick	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
14 Dooley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
15 Evanston	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
16 Farland	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
17*:				
Farland	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Cherry	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
18 Farnuf	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
19*, 20*. Fluvaquents				
21 Glendive	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
22 Grail	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
23 Harlem	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
24 Havre	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
25*:				
Havre	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Glendive	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
26, 27 Havrelon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
28*, 29*:				
Havrelon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Trembles	Good	Improbable: excess fines.	Improbable: excess fines.	Good.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
30 Hillon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey, slope.
31 Hillon	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
32*: Hillon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey, slope.
Tinsley	Fair: large stones.	Probable	Probable	Poor: small stones, area reclaim.
33*: Hillon	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Tinsley	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
34 Lallie	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, wetness.
35 Lihen	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
36, 37 Lohler	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
38 Martinsdale	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
39 McKenzie	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
40 Nishon	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
41 Nobe	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, too clayey.
42, 43 Parshall	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
44*: Phillips	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
Elloam	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excsss sodium.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
45*. Riverwash				
46 Savage	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
47 Tally	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
48 Tally	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
49*:				
Tally	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Lihen	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
50 Telstad	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey, small stones.
51*:				
Telstad	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey, small stones.
Hillon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey. small stones.
52*:				
Thebo	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Lisam	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, too clayey, slope.
53 Tinsley	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
54, 55 Trembles	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
56, 57 Turner	Good	Probable	Probable	Poor: small stones, area reclaim.
58*, 59*:				
Turner	Good	Probable	Probable	Poor: small stones, area reclaim.
Beaverton	Fair: large stones.	Probable	Probable	Poor: small stones, area reclaim.
60*. Typic Fluvaquents				
61*. Typic Ustifluvents				

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
62*. Ustic Torrifluvents				
63*. Ustifluvents				
64 Vanda Variant	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
65*: Vanda Variant	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Thebo	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Lisam	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, too clayey.
66*: Wabek	Poor: slope.	Probable	Probable	Poor: small stones, slope, area reclaim.
Cabba	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer, slope.
Tinsley	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
67*: Wabek	Good	Probable	Probable	Poor: small stones, area reclaim.
Tinsley	Fair: large stones.	Probable	Probable	Poor: small stones, area reclaim.
68, 69 Williams	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, area reclaim.
70*: Williams	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, area reclaim.
Zahill	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, area reclaim.
71 Zahill	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, area reclaim, slope.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
72. Zahill	Poor: slope, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
73*:				
Zahill	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, area reclaim, slope.
Cabba	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer.
Cambert	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer, slope.
74*:				
Zahill	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Cabba	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer, slope.
Cambert	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
75*:				
Zahill	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, area reclaim, slope.
Tinsley	Fair: large stones.	Probable	Probable	Poor: small stones, area reclaim.
76*:				
Zahill	Poor: slope, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Tinsley	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
77. Zahl	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
78. Zahl	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim, slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
1----------------- Adger	Moderate: slope.	Severe: excess sodium, excess salt.	Deep to water	Excess salt, percs slowly, excess sodium.	Erodes easily, percs slowly.	Excess salt, excess sodium, erodes easily.
2*:						
Adger------------	Moderate: slope.	Severe: excess sodium, excess salt.	Deep to water	Excess salt, percs slowly, excess sodium.	Erodes easily, percs slowly.	Excess salt, excess sodium, erodes easily.
Farnuf-----------	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
3*:						
Adger------------	Slight---------	Severe: excess sodium, excess salt.	Deep to water	Excess salt, percs slowly, excess sodium.	Erodes easily, percs slowly.	Excess salt, excess sodium, erodes easily.
Nobe-------------	Slight---------	Severe: excess salt.	Deep to water	Droughty, percs slowly, excess salt.	Erodes easily, percs slowly.	Excess salt, erodes easily, droughty.
4*. Badland						
5----------------- Banks	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty-------	Too sandy------	Droughty.
6----------------- Blanchard	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
7*:						
Bowbells---------	Slight---------	Moderate: piping.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Bowbells---------	Moderate: seepage.	Moderate: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
8----------------- Bowdoin	Slight---------	Severe: hard to pack.	Deep to water	Slow intake, percs slowly, erodes easily.	Erodes easily, percs slowly.	Excess salt, erodes easily, percs slowly.
9*:						
Cabba------------	Severe: slope.	Severe: piping.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Cambert----------	Severe: slope.	Severe: piping.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
10*:						
Cabba------------	Severe: slope.	Severe: piping.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Cambert----------	Severe: slope.	Severe: piping.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
10*:						
Cherry	Severe: slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
11*:						
Cabba	Severe: slope.	Severe: piping.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Cambert	Severe: slope.	Severe: piping.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, depth to rock, erodes easily.
Rock outcrop.						
12 Cherry	Moderate: slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
13 Dimmick	Slight	Severe: hard to pack, ponding.	Ponding, percs slowly.	Ponding, slow intake, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
14 Dooley	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Soil blowing, percs slowly.	Soil blowing, percs slowly.	Percs slowly.
15 Evanston	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
16 Farland	Moderate: slope.	Severe: piping.	Deep to water	Slope	Favorable	Favorable.
17*:						
Farland	Moderate: slope.	Severe: piping.	Deep to water	Slope	Favorable	Favorable.
Cherry	Moderate: slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
18 Farnuf	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
19*, 20*. Fluvaquents						
21 Glendive	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing	Soil blowing	Favorable.
22 Grail	Slight	Moderate: hard to pack.	Deep to water	Percs slowly, erodes easily.	Percs slowly, erodes easily.	Percs slowly, erodes easily.
23 Harlem	Slight	Severe: hard to pack.	Deep to water	Percs slowly	Erodes easily, percs slowly.	Percs slowly.
24 Havre	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Favorable	Favorable.
25*:						
Havre	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Favorable	Favorable.
Glendive	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing	Soil blowing	Favorable.
26 Havrelon	Moderate: seepage.	Severe: piping.	Deep to water	Flooding	Favorable	Favorable.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
27----------------- Havrelon	Moderate: seepage.	Severe: piping.	Deep to water	Favorable------	Favorable------	Favorable.
28*:						
Havrelon----------	Moderate: seepage.	Severe: piping.	Deep to water	Flooding-------	Favorable------	Favorable.
Trembles----------	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, flooding.	Soil blowing---	Favorable.
29*:						
Havrelon----------	Moderate: seepage.	Severe: piping.	Deep to water	Favorable------	Favorable------	Favorable.
Trembles----------	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing---	Soil blowing---	Favorable.
30, 31------------ Hillon	Severe: slope.	Moderate: piping.	Deep to water	Percs slowly, slope, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
32*, 33*:						
Hillon------------	Severe: slope.	Moderate: piping.	Deep to water	Percs slowly, slope, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
Tinsley-----------	Severe: seepage, slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones, too sandy.	Large stones, slope, droughty.
34----------------- Lallie	Slight----------	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, slow intake, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, excess salt, erodes easily.
35----------------- Lihen	Severe: seepage.	Severe: piping, seepage.	Deep to water	Droughty, slope, soil blowing.	Too sandy, soil blowing.	Droughty.
36----------------- Lohler	Slight----------	Severe: hard to pack.	Deep to water	Slow intake, percs slowly, flooding.	Percs slowly---	Percs slowly.
37----------------- Lohler	Slight----------	Severe: hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly---	Percs slowly.
38----------------- Martinsdale	Moderate: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
39----------------- McKenzie	Slight----------	Severe: hard to pack, ponding.	Ponding, percs slowly.	Ponding, percs slowly, erodes easily.	Ponding, percs slowly, erodes easily.	Wetness, excess salt, percs slowly.
40----------------- Nishon	Slight----------	Severe: ponding.	Percs slowly, ponding.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
41----------------- Nobe	Slight----------	Severe: excess salt.	Deep to water	Droughty, percs slowly, excess salt.	Erodes easily, percs slowly.	Excess salt, erodes easily, droughty.
42----------------- Parshall	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing---	Too sandy, soil blowing.	Favorable.
43----------------- Parshall	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, percs slowly.	Too sandy, soil blowing.	Favorable.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
44*:						
Phillips	Moderate: slope.	Severe: piping.	Deep to water	Percs slowly, erodes easily, slope.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Elloam	Moderate: slope.	Severe: piping.	Deep to water	Droughty, percs slowly, slope.	Erodes easily, percs slowly.	Erodes easily, droughty, percs slowly.
45*. Riverwash						
46 Savage	Moderate: slope.	Moderate: piping.	Deep to water	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
47 Tally	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing, slope.	Soil blowing	Favorable.
48 Tally	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Soil blowing, slope.	Slope, soil blowing.	Slope.
49*:						
Tally	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing, slope.	Soil blowing	Favorable.
Lihen	Severe: seepage.	Severe: piping, seepage.	Deep to water	Droughty, slope, soil blowing.	Too sandy, soil blowing.	Droughty.
50 Telstad	Moderate: slope.	Severe: piping.	Deep to water	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
51*:						
Telstad	Moderate: slope.	Severe: piping.	Deep to water	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Hillon	Moderate: slope.	Moderate: piping.	Deep to water	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
52*:						
Thebo	Severe: slope.	Severe: hard to pack.	Deep to water	Slow intake, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Lisam	Severe: depth to rock, slope.	Severe: hard to pack.	Deep to water	Slow intake, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, depth to rock, erodes easily.
53 Tinsley	Severe: seepage, slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones, too sandy.	Large stones, slope, droughty.
54 Trembles	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, flooding.	Soil blowing	Favorable.
55 Trembles	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing	Soil blowing	Favorable.
56 Turner	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, soil blowing.	Soil blowing, too sandy.	Droughty.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
57----------------- Turner	Severe: seepage	Severe: seepage.	Deep to water	Droughty, soil blowing, slope.	Soil blowing, too sandy.	Droughty.
58*:						
Turner------------	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, soil blowing, slope.	Soil blowing, too sandy.	Droughty.
Beaverton---------	Severe: seepage.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, soil blowing.	Large stones, too sandy, soil blowing.	Large stones, droughty.
59*:						
Turner------------	Severe: seepage, slope.	Severe: seepage.	Deep to water	Droughty, soil blowing, slope.	Slope, soil blowing, too sandy.	Slope, droughty.
Beaverton---------	Severe: seepage, slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, soil blowing.	Slope, large stones, too sandy.	Large stones, slope, droughty.
60*. Typic Fluvaquents						
61*. Typic Ustifluvents						
62*. Ustic Torrifluvents						
63*. Ustifluvents						
64----------------- Vanda Variant	Moderate: slope.	Severe: hard to pack.	Deep to water	Slow intake, percs slowly, slope.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
65*:						
Vanda Variant-----	Moderate: slope.	Severe: hard to pack.	Deep to water	Slow intake, percs slowly, slope.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Thebo-------------	Severe: slope.	Severe: hard to pack.	Deep to water	Slow intake, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Lisam-------------	Severe: depth to rock, slope.	Severe: hard to pack.	Deep to water	Slow intake, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, depth to rock, percs slowly.
66*:						
Wabek-------------	Severe: seepage, slope.	Severe: seepage.	Deep to water	Droughty, soil blowing, slope.	Too sandy, soil blowing, slope.	Slope, droughty.
Cabba-------------	Severe: slope.	Severe: piping.	Deep to water	Depth to rock, slope.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Tinsley-----------	Severe: seepage, slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty.	Slope, large stones, too sandy.	Large stones, slope, droughty.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
67*:						
Wabek	Severe: seepage, slope.	Severe: seepage.	Deep to water	Droughty, soil blowing, slope.	Too sandy, soil blowing, slope.	Slope, droughty.
Tinsley	Severe: seepage, slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty.	Slope, large stones, too sandy.	Large stones, slope, droughty.
68 Williams	Slight	Moderate: piping.	Deep to water	Percs slowly	Erodes easily, percs slowly.	Erodes easily, percs slowly.
69 Williams	Moderate: slope.	Moderate: piping.	Deep to water	Percs slowly, slope.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
70*:						
Williams	Moderate: slope.	Moderate: piping.	Deep to water	Percs slowly, slope.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Zahill	Moderate: slope.	Severe: piping.	Deep to water	Slope, erodes easily, percs slowly.	Erodes easily, percs slowly.	Erodes easily.
71, 72 Zahill	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.	Slope, erodes easily.
73*, 74*:						
Zahill	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.	Slope, erodes easily.
Cabba	Severe: slope.	Severe: piping.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Cambert	Severe: slope.	Severe: piping.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, depth to rock, erodes easily.
75*, 76*:						
Zahill	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly,	Slope, erodes easily.
Tinsley	Severe: seepage, slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty.	Slope, large stones, too sandy.	Large stones, slope, droughty.
77 Zahl	Moderate: slope.	Moderate: piping.	Deep to water	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
78 Zahl	Severe: slope.	Moderate: piping.	Deep to water	Percs slowly, slope, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--ENGINEERING INDEX PROPERTIES

[The symbol > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
1----------------- Adger	0-4	Silty clay loam	CL	A-6, A-7	0-10	90-100	85-100	75-100	65-90	30-45	10-20
	4-8	Clay, silty clay	CH, CL	A-7	0-10	90-100	85-100	80-100	70-95	40-65	20-45
	8-60	Clay loam, silty clay, clay.	CL, CH	A-6, A-7	0-10	90-100	85-100	75-100	65-95	35-60	15-40
2*:											
Adger------------	0-4	Silty clay loam	CL	A-6, A-7	0-10	90-100	85-100	75-100	65-90	30-45	10-20
	4-8	Clay, silty clay	CH, CL	A-7	0-10	90-100	85-100	80-100	70-95	40-65	20-45
	8-60	Clay loam, silty clay, clay.	CL, CH	A-6, A-7	0-10	90-100	85-100	75-100	65-95	35-60	15-40
Farnuf-----------	0-7	Loam--------------	ML	A-4	0	80-100	75-100	60-100	55-80	20-35	NP-10
	7-18	Clay loam, loam, silty clay loam.	CL	A-6	0	80-100	75-100	55-95	50-90	25-40	10-20
	18-36	Loam, clay loam, silt loam.	CL, CL-ML, SC, SM-SC	A-6, A-4	0	80-100	75-100	55-95	45-80	25-35	5-15
	36-60	Stratified gravelly sandy loam to silty clay loam.	CL, SC, CL-ML, SM-SC	A-6, A-4	0-15	75-100	65-100	50-95	45-70	20-30	5-15
3*:											
Adger------------	0-4	Silty clay loam	CL	A-6, A-7	0-10	90-100	85-100	75-100	65-90	30-45	10-20
	4-8	Clay, silty clay	CH, CL	A-7	0-10	90-100	85-100	80-100	70-95	40-65	20-45
	8-60	Clay loam, silty clay, clay.	CL, CH	A-6, A-7	0-10	90-100	85-100	75-100	65-95	35-60	15-40
Nobe-------------	0-7	Silty clay--------	CL, CH	A-7	0	100	100	95-100	90-95	40-55	15-30
	7-60	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	40-60	20-35
4*. Badland											
5----------------- Banks	0-12	Loam--------------	SM, ML	A-4	0	100	100	80-95	45-75	20-40	NP-10
	12-60	Loamy fine sand, fine sand, sand.	SM, SP-SM	A-2	0	100	100	50-70	10-25	---	NP
6----------------- Blanchard	0-4	Loamy fine sand	SM	A-2	0	100	100	65-80	20-35	---	NP
	4-60	Fine sand, loamy sand, loamy fine sand.	SM	A-2	0	100	100	60-85	15-35	---	NP
7*:											
Bowbells---------	0-5	Silt loam---------	CL, ML, CL-ML	A-4, A-6	0-5	95-100	90-100	85-95	60-90	20-40	3-23
	5-46	Silty clay loam, clay loam.	CL	A-6	0	95-100	90-100	80-100	65-85	30-35	10-15
	46-60	Loam, silty clay loam, clay loam.	CL, CL-ML	A-6, A-4	0	95-100	90-100	75-100	60-85	25-35	5-15
Bowbells---------	0-7	Silt loam---------	CL-ML	A-4	0	95-100	90-100	85-95	60-90	25-30	5-10
	7-37	Silty clay loam, clay loam.	CL	A-6	0	95-100	90-100	80-100	65-85	30-35	10-15
	37-45	Silty clay loam, clay loam.	CL	A-6	0	95-100	90-100	80-100	65-85	30-35	10-15
	45-60	Stratified very fine sandy loam to loamy fine sand.	SM	A-4	0	95-100	90-100	65-95	35-65	20-25	NP-5

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
8----------------- Bowdoin	0-3	Clay--------------	CH	A-7	0	100	100	90-100	80-95	60-85	30-55
	3-60	Clay--------------	CH	A-7	0	100	100	90-100	80-95	60-85	30-55
9*:											
Cabba------------	0-5	Silt loam---------	ML, CL-ML	A-4	0-5	90-100	85-100	70-90	60-80	20-30	NP-10
	5-18	Gravelly loam, clay loam, silty clay loam.	GC, CL, SC, CL-ML	A-6, A-4	0-5	70-100	55-100	45-85	40-80	25-35	5-15
	18	Weathered bedrock	---	---	---	---	---	---	---	---	---
Cambert----------	0-4	Silt loam---------	CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-30	5-10
	4-24	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-95	25-35	5-15
	24-30	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-95	25-35	5-15
	30	Weathered bedrock									
10*:											
Cabba------------	0-5	Silt loam---------	ML, CL-ML	A-4	0-5	90-100	85-100	70-90	60-80	20-30	NP-10
	5-18	Gravelly loam, clay loam, silty clay loam.	GC, CL, SC, CL-ML	A-6, A-4	0-5	70-100	55-100	45-85	40-80	25-35	5-15
	18	Weathered bedrock	---	---	---	---	---	---	---	---	---
Cambert----------	0-4	Silt loam---------	CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-30	5-10
	4-24	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-95	25-35	5-15
	24-30	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-95	25-35	5-15
	30	Weathered bedrock									
Cherry-----------	0-4	Silt loam---------	CL	A-6	0	100	100	85-100	60-90	25-35	10-20
	4-60	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-95	25-45	10-30
11*:											
Cabba------------	0-5	Silt loam---------	ML, CL-ML	A-4	0-5	90-100	85-100	70-90	60-80	20-30	NP-10
	5-18	Gravelly loam, clay loam, silty clay loam.	GC, CL, SC, CL-ML	A-6, A-4	0-5	70-100	55-100	45-85	40-80	25-35	5-15
	18	Weathered bedrock	---	---	---	---	---	---	---	---	---
Cambert----------	0-4	Silt loam---------	CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-30	5-10
	4-24	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-95	25-35	5-15
	24-30	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-95	25-35	5-15
	30	Weathered bedrock									
Rock outcrop.											
12----------------- Cherry	0-4	Silt loam---------	CL	A-6	0	100	100	85-100	60-90	25-35	10-20
	4-60	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-95	25-45	10-30
13----------------- Dimmick	0-7	Silty clay--------	CH, CL	A-7	0	100	100	90-100	75-95	40-60	15-35
	7-60	Clay, silty clay	CH, CL	A-7	0	100	100	90-100	75-95	45-70	20-45
14----------------- Dooley	0-6	Sandy loam--------	ML, SM	A-4	0-5	90-100	80-100	65-90	35-60	20-25	NP-5
	6-23	Sandy clay loam	CL, CL-ML, SM-SC, SC	A-4, A-6	0-5	90-100	80-100	65-95	40-70	25-40	5-15
	23-60	Clay loam, loam	CL, CL-ML	A-6, A-4	0-5	90-100	85-100	75-100	55-75	25-35	5-15
15----------------- Evanston	0-4	Loam--------------	CL, CL-ML	A-4, A-6	0-5	95-100	95-100	85-90	65-70	25-35	5-15
	4-23	Clay loam, loam, silty clay loam.	CL	A-6	0-5	95-100	95-100	85-100	65-80	25-35	10-15
	23-60	Loam, clay loam, fine sandy loam.	CL	A-6	0-5	95-100	95-100	70-90	50-65	25-35	10-15

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
16----------------- Farland	0-7	Silt loam---------	CL, CL-ML	A-4, A-6	0	100	100	85-100	70-90	20-40	5-25
	7-11	Silty clay loam, clay loam.	CL, CH	A-7	0	100	100	90-100	75-95	40-60	15-35
	11-60	Loam, silt loam, silty clay loam.	CL, CL-ML	A-6, A-7, A-4	0	100	100	85-100	70-90	25-50	5-30
17*:											
Farland-----------	0-7	Silt loam---------	CL, CL-ML	A-4, A-6	0	100	100	85-100	70-90	20-40	5-25
	7-11	Silty clay loam, clay loam.	CL, CH	A-7	0	100	100	90-100	75-95	40-60	15-35
	11-60	Loam, silt loam, silty clay loam.	CL, CL-ML	A-6, A-7, A-4	0	100	100	85-100	70-90	25-50	5-30
Cherry------------	0-4	Silt loam---------	CL	A-6	0	100	100	85-100	60-90	25-35	10-20
	4-60	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-95	25-45	10-30
18----------------- Farnuf	0-6	Loam--------------	ML	A-4	0	80-100	75-100	60-100	55-80	20-35	NP-10
	6-18	Clay loam, loam, silty clay loam.	CL	A-6	0	80-100	75-100	55-95	50-90	25-40	10-20
	18-36	Loam, clay loam, silt loam.	CL, CL-ML, SC, SM-SC	A-6, A-4	0	80-100	75-100	55-95	45-80	25-35	5-15
	36-60	Stratified gravelly sandy loam to silty clay loam.	CL, SC, CL-ML, SM-SC	A-6, A-4	0-15	75-100	65-100	50-95	45-70	20-30	5-15
19*, 20*. Fluvaquents											
21----------------- Glendive	0-7	Fine sandy loam	SM	A-4, A-2	0	100	100	60-80	30-50	15-25	NP-5
	7-15	Loam, silt loam, sandy loam.	ML, CL-ML, SM, SM-SC	A-4	0	100	100	65-95	40-70	15-30	NP-10
	15-60	Stratified loamy fine sand to silt loam.	SM, SM-SC	A-4, A-2	0	85-100	75-100	55-85	25-50	15-25	NP-10
22----------------- Grail	0-5	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	30-45	15-30
	5-60	Silty clay, silty clay loam, clay.	CL, CH	A-7, A-6	0	100	100	95-100	70-95	35-55	15-35
23----------------- Harlem	0-4	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	80-95	35-45	10-20
	4-60	Stratified clay to silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-70	15-45
24----------------- Havre	0-7	Silt loam---------	CL-ML	A-4	0	100	100	80-95	60-90	20-30	5-10
	7-60	Stratified fine sandy loam to clay loam.	CL-ML, CL	A-4, A-6	0	100	100	70-95	60-80	20-35	5-15
25*:											
Havre-------------	0-7	Silt loam---------	CL-ML	A-4	0	100	100	80-95	60-90	20-30	5-10
	7-60	Stratified fine sandy loam to clay loam.	CL-ML, CL	A-4, A-6	0	100	100	70-95	60-80	20-35	5-15
Glendive----------	0-7	Fine sandy loam	SM	A-4, A-2	0	100	100	60-80	30-50	15-25	NP-5
	7-15	Loam, silt loam, sandy loam.	ML, CL-ML, SM, SM-SC	A-4	0	100	100	65-95	40-70	15-30	NP-10
	15-60	Stratified loamy fine sand to silt loam.	SM, SM-SC	A-4, A-2	0	85-100	75-100	55-85	25-50	15-25	NP-10
26----------------- Havrelon	0-7	Loam--------------	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	85-100	60-95	20-45	3-28
	7-60	Stratified silty clay loam to very fine sandy loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	85-100	60-80	20-45	3-28

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
27---------------- Havrelon	0-13	Silt loam--------	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	85-100	60-95	20-45	3-28
	13-60	Stratified silty clay loam to very fine sandy loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	85-100	60-80	20-45	3-28
28*:											
Havrelon---------	0-7	Loam-------------	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	85-100	60-95	20-45	3-28
	7-60	Stratified silty clay loam to very fine sandy loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	85-100	60-80	20-45	3-28
Trembles---------	0-8	Fine sandy loam	SM, ML	A-4	0	100	100	75-85	45-55	20-30	NP-5
	8-48	Stratified fine sandy loam to loam.	SM, ML	A-2, A-4	0	100	100	65-85	30-55	20-30	NP-5
	48-60	Stratified fine sandy loam to loamy sand.	SM	A-2, A-4	0	100	100	60-80	25-50	15-25	NP-5
29*:											
Havrelon---------	0-13	Silt loam--------	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	85-100	60-95	20-45	3-28
	13-60	Stratified silty clay loam to very fine sandy loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	85-100	60-80	20-45	3-28
Trembles---------	0-8	Fine sandy loam	SM, ML	A-4	0	100	100	70-85	40-55	20-30	NP-5
	8-48	Stratified fine sandy loam to loam.	SM, ML	A-4	0	100	100	65-85	35-60	20-30	NP-5
	48-60	Stratified fine sandy loam to loamy sand.	SM	A-4, A-2	0	100	100	60-80	25-50	15-25	NP-5
30---------------- Hillon	0-8	Loam-------------	ML, CL, CL-ML	A-4, A-6	0-5	85-100	80-100	80-90	65-75	20-35	NP-15
	8-60	Loam, clay loam	CL	A-6	0-5	85-100	80-100	80-90	65-80	25-35	10-20
31---------------- Hillon	0-7	Loam-------------	ML, CL, CL-ML	A-4, A-6	0-5	85-100	80-100	80-90	65-75	20-35	NP-15
	7-60	Loam, clay loam	CL	A-6	0-5	85-100	80-100	80-90	65-80	25-35	10-20
32*:											
Hillon-----------	0-8	Loam-------------	ML, CL, CL-ML	A-4, A-6	0-5	85-100	80-100	80-90	65-75	20-35	NP-15
	8-60	Loam, clay loam	CL	A-6	0-5	85-100	80-100	80-90	65-80	25-35	10-20
Tinsley----------	0-3	Very gravelly sandy loam.	GM	A-1, A-2	0-15	40-65	30-50	20-45	15-35	15-20	NP-5
	3-60	Very gravelly sand, very cobbly loamy sand, extremely gravelly sand.	GM, SM, SP-SM, GP-GM	A-1	10-40	40-70	25-55	10-35	5-15	---	NP
33*:											
Hillon-----------	0-7	Loam-------------	ML, CL, CL-ML	A-4, A-6	0-5	85-100	80-100	80-90	65-75	20-35	NP-15
	7-60	Loam, clay loam	CL	A-6	0-5	85-100	80-100	80-90	65-80	25-35	10-20

See footnote at end of table.

TABLE 11--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
33*:											
Tinsley	0-3	Very gravelly sandy loam.	GM	A-1, A-2	0-15	40-65	30-50	20-45	15-35	15-20	NP-5
	3-60	Very gravelly sand, very cobbly loamy sand, extremely gravelly sand.	GM, SM, SP-SM, GP-GM	A-1	10-40	40-70	25-55	10-35	5-15	---	NP
34 Lallie	0-3	Silty clay	CL, CH	A-7	0	100	100	95-100	85-95	45-70	20-45
	3-60	Silty clay loam, silty clay, clay.	CL, CH	A-7	0	100	100	95-100	85-95	45-70	20-45
35 Lihen	0-9	Sandy loam	SM	A-4	0	100	85-100	60-80	35-50	20-25	NP-5
	9-60	Loamy fine sand, loamy sand, sand.	SM	A-2, A-1	0	100	85-100	45-75	15-35	---	NP
36, 37 Lohler	0-7	Silty clay	CH, CL	A-7	0	100	100	95-100	80-95	45-70	25-50
	7-60	Silty clay, clay, silty clay loam.	CH, CL	A-7	0	100	100	95-100	80-95	45-70	25-50
38 Martinsdale	0-6	Loam	CL-ML	A-4	0-5	95-100	90-100	60-85	50-75	20-30	5-10
	6-21	Sandy clay loam, clay loam, loam.	CL	A-6	0-5	85-100	80-100	60-80	50-70	30-40	10-15
	21-60	Sandy loam, clay loam, loam.	SM-SC, CL-ML	A-4	0-5	90-100	85-100	60-100	35-75	20-30	5-10
39 McKenzie	0-4	Clay loam	CL, CH	A-7	0	100	100	95-100	85-95	45-75	25-45
	4-26	Clay, silty clay	CH	A-7	0	100	100	95-100	75-95	50-75	25-50
	26-60	Clay, silty clay	CH	A-7	0	100	100	95-100	75-95	50-75	25-50
40 Nishon	0-7	Clay loam	CL	A-6, A-7	0	100	100	85-100	60-80	30-45	10-20
	7-21	Clay, clay loam, silty clay.	CL, CH	A-7	0	95-100	90-100	80-100	70-95	40-65	15-40
	21-60	Clay, silty clay, clay loam.	CL, CH	A-6, A-7	0	90-100	90-100	80-100	65-90	35-60	15-40
41 Nobe	0-7	Silty clay	CL, CH	A-7	0	100	100	95-100	90-95	40-55	15-30
	7-60	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	40-60	20-35
42 Parshall	0-25	Sandy loam	SM, ML	A-4, A-2	0	100	100	60-85	30-55	---	NP
	25-60	Fine sandy loam, sandy loam, loamy sand.	SM, ML	A-4, A-2	0	100	100	60-100	30-55	---	NP
43 Parshall	0-12	Sandy loam	SM, SM-SC	A-2, A-4	0	100	95-100	60-80	25-45	15-25	NP-5
	12-40	Sandy loam, fine sandy loam, loamy sand.	SM, SM-SC	A-2, A-4	0	100	95-100	55-80	20-45	15-25	NP-5
	40-60	Silt loam, clay loam, loam.	CL-ML, CL	A-4, A-6	0	100	100	80-95	60-80	25-35	5-15
44*:											
Phillips	0-3	Loam	CL-ML	A-4	0-5	85-100	80-100	70-95	50-75	20-30	5-10
	3-15	Clay, clay loam	CL	A-6, A-7	0-5	85-100	80-100	70-95	60-85	35-50	15-25
	15-25	Clay loam, loam	CL	A-6, A-7	0-5	85-100	80-100	75-100	55-80	30-45	10-20
	25-60	Clay loam, loam	CL, CL-ML	A-6, A-4	0-5	85-100	80-100	70-90	55-75	25-40	5-15
Elloam	0-5	Clay loam	CL	A-6	0-5	95-100	80-100	70-100	55-80	30-40	10-15
	5-12	Clay loam, clay	CL	A-6, A-7	0-5	95-100	80-100	70-100	55-90	35-50	15-25
	12-20	Clay loam, clay	CL	A-6, A-7	0-5	95-100	80-100	65-100	50-80	30-45	10-20
	20-60	Clay loam, loam	CL, CL-ML	A-4, A-6	0-5	85-100	80-100	70-90	55-75	25-40	5-15
45*. Riverwash											

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
46---------------- Savage	0-6	Clay loam---------	CL, CL-ML	A-6, A-4	0	95-100	95-100	85-100	60-80	25-40	5-15
	6-15	Clay, silty clay, silty clay loam.	CL	A-7, A-6	0	95-100	95-100	85-100	75-95	35-50	15-30
	15-60	Silty clay, silty clay loam, clay.	CL	A-7, A-6	0-5	90-100	85-100	75-100	65-95	30-50	10-30
47, 48------------ Tally	0-6	Sandy loam--------	SM	A-2, A-4	0	90-100	80-100	55-80	25-50	15-25	NP-5
	6-32	Fine sandy loam, sandy loam.	SM, SM-SC	A-4, A-2	0	90-100	80-100	60-100	25-50	15-25	NP-10
	32-60	Sandy loam, fine sandy loam, loamy fine sand.	SM	A-4, A-2	0	90-100	80-100	60-100	15-50	15-25	NP-5
49*: Tally------------	0-6	Sandy loam--------	SM	A-2, A-4	0	90-100	80-100	55-80	25-50	15-25	NP-5
	6-32	Fine sandy loam, sandy loam.	SM, SM-SC	A-4, A-2	0	90-100	80-100	60-100	25-50	15-25	NP-10
	32-60	Sandy loam, fine sandy loam, loamy fine sand.	SM	A-4, A-2	0	90-100	80-100	60-100	15-50	15-25	NP-5
Lihen------------	0-9	Sandy loam--------	SM	A-4	0	100	85-100	60-80	35-50	20-25	NP-5
	9-60	Loamy fine sand, loamy sand, sand.	SM	A-2, A-1	0	100	85-100	45-75	15-35	---	NP
50---------------- Telstad	0-5	Loam--------------	CL-ML	A-4	0-5	85-100	80-100	65-90	50-70	25-30	5-10
	5-15	Clay loam, loam	CL	A-6	0-5	95-100	90-100	80-95	60-80	30-40	10-20
	15-60	Clay loam, loam	CL-ML, CL	A-6, A-4	0-5	95-100	90-100	80-95	60-80	25-35	5-15
51*: Telstad----------	0-5	Loam--------------	CL-ML	A-4	0-5	85-100	80-100	65-90	50-70	25-30	5-10
	5-15	Clay loam, loam	CL	A-6	0-5	95-100	90-100	80-95	60-80	30-40	10-20
	15-60	Clay loam, loam	CL-ML, CL	A-6, A-4	0-5	95-100	90-100	80-95	60-80	25-35	5-15
Hillon-----------	0-8	Loam--------------	ML, CL, CL-ML	A-4, A-6	0-5	85-100	80-100	80-90	65-75	20-35	NP-15
	8-60	Loam, clay loam	CL	A-6	0-5	85-100	80-100	80-90	65-80	25-35	10-20
52*: Thebo------------	0-2	Clay--------------	CH	A-7	0	100	100	90-100	75-95	50-70	30-50
	2-32	Clay--------------	CH	A-7	0	100	100	90-100	75-95	60-80	40-60
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Lisam------------	0-17	Silty clay--------	CH	A-7	0	100	100	90-100	80-95	50-75	25-50
	17	Weathered bedrock	---	---	---	---	---	---	---	---	---
53---------------- Tinsley	0-3	Very gravelly sandy loam.	GM	A-1, A-2	0-15	40-65	30-50	20-45	15-35	15-20	NP-5
	3-60	Very gravelly sand, very cobbly loamy sand, extremely gravelly sand.	GM, SM, SP-SM, GP-GM	A-1	10-40	40-70	25-55	10-35	5-15	---	NP
54---------------- Trembles	0-8	Fine sandy loam	SM, ML	A-4	0	100	100	75-85	45-55	20-30	NP-5
	8-48	Stratified fine sandy loam to loam.	SM, ML	A-2, A-4	0	100	100	65-85	30-55	20-30	NP-5
	48-60	Stratified fine sandy loam to loamy sand.	SM	A-2, A-4	0	100	100	60-80	25-50	15-25	NP-5

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
55---------------- Trembles	0-8	Fine sandy loam	SM, ML	A-4	0	100	100	70-85	40-55	20-30	NP-5
	8-48	Stratified fine sandy loam to loam.	SM, ML	A-4	0	100	100	65-85	35-60	20-30	NP-5
	48-60	Stratified fine sandy loam to loamy sand.	SM	A-4, A-2	0	100	100	60-80	25-50	15-25	NP-5
56, 57----------- Turner	0-10	Sandy loam--------	SM	A-2, A-4	0-5	90-100	80-100	50-70	20-40	20-25	NP-5
	10-21	Clay loam, sandy clay loam.	CL, GC, SC	A-6	0-5	70-100	65-100	45-75	40-70	30-40	10-20
	21-60	Very gravelly loamy sand, very gravelly sand, extremely gravelly sand.	GP, GM, GP-GM	A-1	10-30	30-50	20-50	10-35	0-15	---	NP
58*, 59*: Turner-----------	0-10	Sandy loam--------	SM	A-2, A-4	0-5	90-100	80-100	50-70	20-40	20-25	NP-5
	10-21	Clay loam, sandy clay loam.	CL, GC, SC	A-6	0-5	70-100	65-100	45-75	40-70	30-40	10-20
	21-60	Very gravelly loamy sand, very gravelly sand, extremely gravelly sand.	GP, GM, GP-GM	A-1	10-30	30-50	20-50	10-35	0-15	---	NP
Beaverton--------	0-4	Very cobbly sandy loam.	SC, GC	A-2, A-4, A-1	30-45	60-75	55-70	40-60	20-40	20-25	NP-5
	4-24	Very cobbly clay loam, very cobbly sandy clay loam.	GC, SC	A-2, A-4	30-50	50-75	45-70	30-60	25-50	25-35	5-15
	24-60	Extremely cobbly loamy sand, extremely cobbly sand, very cobbly loamy sand.	GM, SM, GP, GP-GM	A-1	30-60	35-80	25-70	10-50	0-25	---	NP
60*. Typic Fluvaquents											
61*. Typic Ustifluvents											
62*. Ustic Torrifluvents											
63*. Ustifluvents											
64---------------- Vanda Variant	0-8	Silty clay--------	CL, CH	A-7	0	100	90-100	80-100	75-95	40-65	20-45
	8-24	Silty clay loam, silty clay, clay.	CL, CH	A-7, A-6	0	100	100	80-100	75-95	35-65	15-45
	24-60	Silty clay, clay	CL, CH	A-7	0	100	100	80-100	75-95	40-65	20-45
65*: Vanda Variant---	0-8	Silty clay--------	CL, CH	A-7	0	100	90-100	80-100	75-95	40-65	20-45
	8-24	Silty clay loam, silty clay, clay.	CL, CH	A-7, A-6	0	100	100	80-100	75-95	35-65	15-45
	24-60	Silty clay, clay	CL, CH	A-7	0	100	100	80-100	75-95	40-65	20-45

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
65*:											
Thebo-----------	0-2	Clay-------------	CH	A-7	0	100	100	90-100	75-95	50-70	30-50
	2-32	Clay-------------	CH	A-7	0	100	100	90-100	75-95	60-80	40-60
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Lisam-----------	0-17	Silty clay-------	CH	A-7	0	100	100	90-100	80-95	50-75	25-50
	17	Weathered bedrock	---	---	---	---	---	---	---	---	---
66*:											
Wabek-----------	0-7	Sandy loam-------	SM	A-1, A-2	0-5	85-100	85-100	60-70	30-40	---	NP
	7-19	Very gravelly sandy loam, very gravelly loam.	SM, GM	A-1, A-2, A-4	0-5	35-65	25-50	15-45	10-40	15-20	NP-5
	19-60	Sand and gravel	GM, GP, SM, SP	A-1	0-5	25-75	10-60	5-35	0-25	---	NP
Cabba-----------	0-5	Silt loam--------	ML, CL-ML	A-4	0-5	90-100	85-100	70-90	60-80	20-30	NP-10
	5-18	Gravelly loam, clay loam, silty clay loam.	GC, CL, SC, CL-ML	A-6, A-4	0-5	70-100	55-100	45-85	40-80	25-35	5-15
	18	Weathered bedrock	---	---	---	---	---	---	---	---	---
Tinsley---------	0-3	Very gravelly sandy loam.	GM	A-1, A-2	0-15	40-65	30-50	20-45	15-35	15-20	NP-5
	3-60	Very gravelly sand, very cobbly loamy sand, extremely gravelly sand.	GM, SM, SP-SM, GP-GM	A-1	10-40	40-70	25-55	10-35	5-15	---	NP
67*:											
Wabek-----------	0-7	Sandy loam-------	SM	A-1, A-2	0-5	85-100	85-100	60-70	30-40	---	NP
	7-19	Very gravelly sandy loam, very gravelly loam.	SM, GM	A-1, A-2, A-4	0-5	35-65	25-50	15-45	10-40	15-20	NP-5
	19-60	Sand and gravel	GM, GP, SM, SP	A-1	0-5	25-75	10-60	5-35	0-25	---	NP
Tinsley---------	0-3	Very gravelly sandy loam.	GM	A-1, A-2	0-15	40-65	30-50	20-45	15-35	15-20	NP-5
	3-60	Very gravelly sand, very cobbly loamy sand, extremely gravelly sand.	GM, SM, SP-SM, GP-GM	A-1	10-40	40-70	25-55	10-35	5-15	---	NP
68, 69----------- Williams	0-7	Loam-------------	CL, ML	A-4, A-6, A-7	0-5	95-100	95-100	85-95	60-90	25-45	3-20
	7-12	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	80-100	60-80	30-50	10-30
	12-60	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	80-100	60-80	30-50	10-30
70*:											
Williams--------	0-7	Loam-------------	CL, ML	A-4, A-6, A-7	0-5	95-100	95-100	85-95	60-90	25-45	3-20
	7-12	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	80-100	60-80	30-50	10-30
	12-60	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	80-100	60-80	30-50	10-30
Zahill----------	0-7	Loam-------------	CL-ML, ML	A-4	0-5	90-100	85-95	80-90	60-75	20-30	NP-10
	7-60	Clay loam, loam	CL, CL-ML	A-4, A-6	0-5	90-100	90-100	80-95	60-80	25-40	5-15
71--------------- Zahill	0-5	Loam-------------	CL-ML, ML	A-4	0-5	90-100	85-95	80-90	60-75	20-30	NP-10
	5-60	Clay loam, loam	CL, CL-ML	A-4, A-6	0-5	90-100	90-100	80-95	60-80	25-40	5-15
72--------------- Zahill	0-3	Loam-------------	CL-ML, ML	A-4	0-5	90-100	85-95	80-90	60-75	20-30	NP-10
	3-60	Clay loam, loam	CL, CL-ML	A-4, A-6	0-5	90-100	90-100	80-95	60-80	25-40	5-15

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
73*:											
Zahill----------	0-5	Loam-------------	CL-ML, ML	A-4	0-5	90-100	85-95	80-90	60-75	20-30	NP-10
	5-60	Clay loam, loam	CL, CL-ML	A-4, A-6	0-5	90-100	90-100	80-95	60-80	25-40	5-15
Cabba-----------	0-5	Silt loam--------	ML, CL-ML	A-4	0-5	90-100	85-100	70-90	60-80	20-30	NP-10
	5-18	Gravelly loam, clay loam, silty clay loam.	GC, CL, SC, CL-ML	A-6, A-4	0-5	70-100	55-100	45-85	40-80	25-35	5-15
	18	Weathered bedrock	---	---	---	---	---	---	---	---	---
Cambert---------	0-4	Silt loam--------	CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-30	5-10
	4-24	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-95	25-35	5-15
	24-30	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-95	25-35	5-15
	30	Weathered bedrock									
74*:											
Zahill----------	0-3	Loam-------------	CL-ML, ML	A-4	0-5	90-100	85-95	80-90	60-75	20-30	NP-10
	3-60	Clay loam, loam	CL, CL-ML	A-4, A-6	0-5	90-100	90-100	80-95	60-80	25-40	5-15
Cabba-----------	0-5	Silt loam--------	ML, CL-ML	A-4	0-5	90-100	85-100	70-90	60-80	20-30	NP-10
	5-18	Gravelly loam, clay loam, silty clay loam.	GC, CL, SC, CL-ML	A-6, A-4	0-5	70-100	55-100	45-85	40-80	25-35	5-15
	18	Weathered bedrock	---	---	---	---	---	---	---	---	---
Cambert---------	0-4	Silt loam--------	CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-30	5-10
	4-24	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-95	25-35	5-15
	24-30	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-95	25-35	5-15
	30	Weathered bedrock									
75*:											
Zahill----------	0-5	Loam-------------	CL-ML, ML	A-4	0-5	90-100	85-95	80-90	60-75	20-30	NP-10
	5-60	Clay loam, loam	CL, CL-ML	A-4, A-6	0-5	90-100	90-100	80-95	60-80	25-40	5-15
Tinsley---------	0-3	Very gravelly sandy loam.	GM	A-1, A-2	0-15	40-65	30-50	20-45	15-35	15-20	NP-5
	3-60	Very gravelly sand, very cobbly loamy sand, extremely gravelly sand.	GM, SM, SP-SM, GP-GM	A-1	10-40	40-70	25-55	10-35	5-15	---	NP
76*:											
Zahill----------	0-3	Loam-------------	CL-ML, ML	A-4	0-5	90-100	85-95	80-90	60-75	20-30	NP-10
	3-60	Clay loam, loam	CL, CL-ML	A-4, A-6	0-5	90-100	90-100	80-95	60-80	25-40	5-15
Tinsley---------	0-3	Very gravelly sandy loam.	GM	A-1, A-2	0-15	40-65	30-50	20-45	15-35	15-20	NP-5
	3-60	Very gravelly sand, very cobbly loamy sand, extremely gravelly sand.	GM, SM, SP-SM, GP-GM	A-1	10-40	40-70	25-55	10-35	5-15	---	NP
77-------------- Zahl	0-7	Loam-------------	CL	A-6	0-5	95-100	95-100	80-95	55-75	25-40	10-20
	7-60	Clay loam, loam	CL	A-6	0-5	95-100	90-100	80-95	60-80	25-40	10-20
78-------------- Zahl	0-6	Loam-------------	CL	A-6	0-5	95-100	95-100	80-95	55-75	25-40	10-20
	6-60	Clay loam, loam	CL	A-6	0-5	95-100	90-100	80-95	60-80	25-40	10-20

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
1----------------- Adger	0-4	30-40	0.2-0.6	0.12-0.16	6.6-9.0	4-16	Moderate	0.43	5	4	1-3
	4-8	40-60	<0.06	0.10-0.12	7.9-9.0	>8	High------	0.43			
	8-60	35-55	<0.06	0.10-0.12	7.9-9.0	>8	High------	0.43			
2*:											
Adger-----------	0-4	30-40	0.2-0.6	0.12-0.16	6.6-9.0	4-16	Moderate	0.43	5	4	1-3
	4-8	40-60	<0.06	0.10-0.12	7.9-9.0	>8	High------	0.43			
	8-60	35-55	<0.06	0.10-0.12	7.9-9.0	>8	High------	0.43			
Farnuf----------	0-7	15-27	0.6-2.0	0.16-0.20	6.6-7.8	<2	Low--------	0.37	5	6	2-4
	7-18	25-35	0.6-2.0	0.14-0.18	7.4-7.8	<2	Moderate	0.32			
	18-36	20-30	0.6-2.0	0.14-0.18	7.4-8.4	<2	Moderate	0.32			
	36-60	15-30	0.6-2.0	0.12-0.16	7.4-8.4	<2	Low--------	0.32			
3*:											
Adger-----------	0-4	30-40	0.2-0.6	0.12-0.16	6.6-9.0	4-16	Moderate	0.43	5	4	1-3
	4-8	40-60	<0.06	0.10-0.12	7.9-9.0	>8	High------	0.43			
	8-60	35-55	<0.06	0.10-0.12	7.9-9.0	>8	High------	0.43			
Nobe------------	0-7	40-50	<0.06	0.12-0.16	6.6-8.4	4-8	High------	0.43	5	4	.5-2
	7-60	35-60	<0.06	0.08-0.10	>7.8	>16	High------	0.43			
4*. Badland											
5---------------- Banks	0-12	10-27	2.0-6.0	0.14-0.17	7.4-8.4	<2	Low--------	0.32	5	5	.5-1
	12-60	0-10	6.0-20	0.04-0.05	7.4-8.4	<2	Low--------	0.17			
6---------------- Blanchard	0-4	0-5	6.0-20	0.06-0.09	5.6-7.8	<2	Low--------	0.17	5	2	.5-1
	4-60	0-5	6.0-20	0.07-0.08	6.6-7.8	<2	Low--------	0.17			
7*:											
Bowbells--------	0-5	18-30	0.6-2.0	0.17-0.24	6.1-7.3	<2	Low--------	0.43	5	6	2-4
	5-46	30-35	0.2-0.6	0.16-0.22	6.1-7.8	<2	Moderate	0.37			
	46-60	20-35	0.06-0.2	0.14-0.18	7.4-8.4	<2	Moderate	0.37			
Bowbells--------	0-7	18-27	0.6-2.0	0.18-0.22	6.1-7.8	<2	Low--------	0.37	5	6	2-4
	7-37	30-35	0.2-0.6	0.14-0.18	6.1-7.8	<2	Moderate	0.37			
	37-45	30-35	0.2-0.6	0.14-0.18	6.1-7.8	<2	Moderate	0.37			
	45-60	5-20	2.0-6.0	0.08-0.11	7.4-8.4	<2	Low--------	0.24			
8---------------- Bowdoin	0-3	50-70	<0.06	0.10-0.13	7.9-8.4	8-16	High------	0.37	5	4	.5-2
	3-60	60-80	<0.06	0.10-0.13	>7.8	8-16	High------	0.37			
9*:											
Cabba-----------	0-5	10-27	0.6-2.0	0.18-0.22	7.4-8.4	<4	Low--------	0.37	2	4L	.5-1
	5-18	15-35	0.6-2.0	0.14-0.18	7.4-8.4	2-8	Low--------	0.37			
	18	---	---	---	---	---	----------	----			
Cambert---------	0-4	15-27	0.6-2.0	0.18-0.22	6.6-8.4	<2	Low--------	0.37	3	4L	.5-1
	4-24	18-35	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.37			
	24-30	18-35	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.32			
	30	---	---	---	---	---	----------	----			
10*:											
Cabba-----------	0-5	10-27	0.6-2.0	0.18-0.22	7.4-8.4	<4	Low--------	0.37	2	4L	.5-1
	5-18	15-35	0.6-2.0	0.14-0.18	7.4-8.4	2-8	Low--------	0.37			
	18	---	---	---	---	---	----------	----			

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
10*:											
Cambert----------	0-4	15-27	0.6-2.0	0.18-0.22	6.6-8.4	<2	Low--------	0.37	3	4L	.5-1
	4-24	18-35	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.37			
	24-30	18-35	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.32			
	30	---	---	---	---	---	-----------	-----			
Cherry-----------	0-4	18-27	0.6-2.0	0.20-0.24	6.6-8.4	<2	Moderate	0.37	5	6	.5-2
	4-60	18-35	0.2-0.6	0.16-0.22	7.9-9.0	<2	Moderate	0.37			
11*:											
Cabba------------	0-5	10-27	0.6-2.0	0.18-0.22	7.4-8.4	<4	Low--------	0.37	2	4L	.5-1
	5-18	15-35	0.6-2.0	0.14-0.18	7.4-8.4	2-8	Low--------	0.37			
	18	---	---	---	---	---	-----------	-----			
Cambert----------	0-4	15-27	0.6-2.0	0.18-0.22	6.6-8.4	<2	Low--------	0.37	3	4L	.5-1
	4-24	18-35	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.37			
	24-30	18-35	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.32			
	30	---	---	---	---	---	-----------	-----			
Rock outcrop.											
12---------------- Cherry	0-4	18-27	0.6-2.0	0.20-0.24	6.6-8.4	<2	Moderate	0.37	5	6	.5-2
	4-60	18-35	0.2-0.6	0.16-0.22	7.9-9.0	<2	Moderate	0.37			
13---------------- Dimmick	0-7	35-50	<0.2	0.14-0.23	6.1-7.3	<2	High-------	0.32	5	8	3-8
	7-60	40-60	<0.06	0.13-0.20	6.6-7.8	<2	High-------	0.32			
14---------------- Dooley	0-6	10-20	2.0-6.0	0.12-0.16	7.4-8.4	<2	Low--------	0.32	5	3	2-4
	6-23	20-35	0.6-2.0	0.13-0.17	7.4-8.4	<2	Moderate	0.32			
	23-60	25-35	0.06-0.2	0.13-0.17	7.4-8.4	<2	Moderate	0.32			
15---------------- Evanston	0-4	20-27	0.6-2.0	0.16-0.18	6.6-7.8	<2	Low--------	0.37	5	6	1-3
	4-23	25-35	0.6-2.0	0.12-0.18	6.6-8.4	<2	Moderate	0.37			
	23-60	10-25	0.6-2.0	0.16-0.18	7.9-8.4	<2	Moderate	0.37			
16---------------- Farland	0-7	15-30	0.6-2.0	0.19-0.21	6.6-7.8	<2	Low--------	0.32	5	6	2-4
	7-11	27-35	0.6-2.0	0.16-0.20	7.4-7.8	<2	Moderate	0.32			
	11-60	20-35	0.2-0.6	0.17-0.20	7.9-8.4	<4	Moderate	0.32			
17*:											
Farland----------	0-7	15-30	0.6-2.0	0.19-0.21	6.6-7.8	<2	Low--------	0.32	5	6	2-4
	7-11	27-35	0.6-2.0	0.16-0.20	7.4-7.8	<2	Moderate	0.32			
	11-60	20-35	0.2-0.6	0.17-0.20	7.9-8.4	<2	Moderate	0.32			
Cherry-----------	0-4	18-27	0.6-2.0	0.20-0.24	6.6-8.4	<2	Moderate	0.37	5	6	.5-2
	4-60	18-35	0.2-0.6	0.16-0.22	7.9-9.0	<2	Moderate	0.37			
18---------------- Farnuf	0-6	15-27	0.6-2.0	0.16-0.20	6.6-7.8	<2	Low--------	0.37	5	6	2-4
	6-18	25-35	0.6-2.0	0.14-0.18	7.4-7.8	<2	Moderate	0.32			
	18-36	20-30	0.6-2.0	0.14-0.18	7.4-8.4	<2	Moderate	0.32			
	36-60	15-30	0.6-2.0	0.12-0.16	7.4-8.4	<2	Low--------	0.32			
19*, 20*. Fluvaquents											
21---------------- Glendive	0-7	5-15	2.0-6.0	0.12-0.16	6.6-8.4	<4	Low--------	0.20	5	3	.5-2
	7-15	5-18	2.0-6.0	0.15-0.19	7.4-8.4	<4	Low--------	0.32			
	15-60	5-18	2.0-6.0	0.10-0.14	7.4-8.4	<4	Low--------	0.28			
22---------------- Grail	0-5	27-35	0.2-0.6	0.20-0.23	6.6-8.4	<2	Moderate	0.37	5	7	2-4
	5-60	35-45	0.06-0.2	0.14-0.17	7.4-8.4	<2	High-------	0.37			
23---------------- Harlem	0-4	27-40	0.06-0.2	0.14-0.18	7.4-8.4	<4	Moderate	0.37	5	7	.5-1
	4-60	35-60	0.06-0.2	0.14-0.18	7.9-9.0	<4	High-------	0.37			

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
24---------------- Havre	0-7	15-27	0.6-2.0	0.16-0.20	7.4-8.4	<4	Low--------	0.37	5	6	.5-1
	7-60	18-35	0.6-2.0	0.14-0.18	7.4-9.0	<8	Low--------	0.28			
25*:											
Havre------------	0-7	15-27	0.6-2.0	0.16-0.20	7.4-8.4	<4	Low--------	0.37	5	6	.5-1
	7-60	18-35	0.6-2.0	0.14-0.18	7.4-9.0	<8	Low--------	0.28			
Glendive---------	0-7	5-15	2.0-6.0	0.12-0.16	6.6-8.4	<4	Low--------	0.20	5	3	.5-2
	7-15	5-18	2.0-6.0	0.15-0.19	7.4-8.4	<4	Low--------	0.32			
	15-60	5-18	2.0-6.0	0.10-0.14	7.4-8.4	<4	Low--------	0.28			
26---------------- Havrelon	0-7	15-35	0.6-2.0	0.20-0.24	7.4-8.4	<2	Moderate	0.37	5	6	.5-1
	7-60	18-30	0.6-2.0	0.15-0.19	7.4-8.4	<2	Moderate	0.32			
27---------------- Havrelon	0-13	15-35	0.6-2.0	0.20-0.24	7.4-8.4	<2	Moderate	0.37	5	6	.5-1
	13-60	18-30	0.6-2.0	0.15-0.19	7.4-8.4	<2	Moderate	0.32			
28*:											
Havrelon---------	0-7	15-35	0.6-2.0	0.20-0.24	7.4-8.4	<2	Moderate	0.37	5	6	.5-1
	7-60	18-30	0.6-2.0	0.15-0.19	7.4-8.4	<2	Moderate	0.32			
Trembles---------	0-8	10-20	2.0-6.0	0.12-0.16	7.4-8.4	<2	Low--------	0.20	5	3	1-3
	8-48	8-15	2.0-6.0	0.11-0.15	7.4-8.4	<2	Low--------	0.20			
	48-60	8-15	2.0-6.0	0.10-0.14	7.4-8.4	<2	Low--------	0.20			
29*:											
Havrelon---------	0-13	15-35	0.6-2.0	0.20-0.24	7.4-8.4	<2	Moderate	0.37	5	6	.5-1
	13-60	18-30	0.6-2.0	0.15-0.19	7.4-8.4	<2	Moderate	0.32			
Trembles---------	0-8	10-20	2.0-6.0	0.12-0.16	7.4-8.4	<2	Low--------	0.20	5	3	1-3
	8-48	8-15	2.0-6.0	0.11-0.15	7.4-8.4	<2	Low--------	0.20			
	48-60	8-15	2.0-6.0	0.10-0.14	7.4-8.4	<2	Low--------	0.20			
30---------------- Hillon	0-8	20-27	0.6-2.0	0.18-0.20	7.4-8.4	<2	Low--------	0.37	5	4L	.5-2
	8-60	20-35	0.06-0.2	0.15-0.18	7.4-8.4	<2	Moderate	0.32			
31---------------- Hillon	0-7	20-27	0.6-2.0	0.18-0.20	7.4-8.4	<2	Low--------	0.37	5	4L	.5-2
	7-60	20-35	0.06-0.2	0.15-0.18	7.4-8.4	<2	Moderate	0.32			
32*:											
Hillon-----------	0-8	20-27	0.6-2.0	0.18-0.20	7.4-8.4	<2	Low--------	0.37	5	4L	.5-2
	8-60	20-35	0.06-0.2	0.15-0.18	7.4-8.4	<2	Moderate	0.32			
Tinsley----------	0-3	5-15	2.0-6.0	0.06-0.09	6.6-7.8	<2	Low--------	0.17	2	5	.5-2
	3-60	0-10	6.0-20	0.01-0.03	6.6-8.4	<2	Low--------	0.10			
33*:											
Hillon-----------	0-7	20-27	0.6-2.0	0.18-0.20	7.4-8.4	<2	Low--------	0.37	5	4L	.5-2
	7-60	20-35	0.06-0.2	0.15-0.18	7.4-8.4	<2	Moderate	0.32			
Tinsley----------	0-3	5-15	2.0-6.0	0.06-0.09	6.6-7.8	<2	Low--------	0.17	2	5	.5-2
	3-60	0-10	6.0-20	0.01-0.03	6.6-8.4	<2	Low--------	0.10			
34---------------- Lallie	0-3	40-60	0.06-0.2	0.16-0.19	6.6-9.0	4-16	High-------	0.32	5	8	3-7
	3-60	35-60	0.06-0.2	0.16-0.19	7.4-9.0	4-16	High-------	0.32			
35---------------- Lihen	0-9	10-20	6.0-20	0.13-0.15	6.1-7.8	<2	Low--------	0.20	5	3	1-2
	9-60	0-10	6.0-20	0.05-0.07	7.4-8.4	<2	Low--------	0.17			
36, 37------------ Lohler	0-7	40-60	0.06-0.2	0.15-0.18	6.6-8.4	<2	High-------	0.32	5	4	.5-2
	7-60	35-60	0.06-0.2	0.13-0.17	7.4-9.0	<2	High-------	0.32			
38---------------- Martinsdale	0-6	18-27	0.6-2.0	0.16-0.20	6.6-7.8	<2	Low--------	0.37	5	6	2-4
	6-21	25-35	0.2-0.6	0.14-0.18	6.6-8.4	<2	Moderate	0.37			
	21-60	15-35	0.2-0.6	0.12-0.16	7.4-8.4	<2	Moderate	0.37			

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
39----------------- McKenzie	0-4	27-40	0.06-0.2	0.13-0.17	6.6-7.8	2-8	High------	0.43	5	8	2-4
	4-26	40-60	<0.06	0.13-0.17	6.6-8.4	2-8	High------	0.37			
	26-60	40-60	<0.06	0.13-0.17	7.9-9.0	2-8	High------	0.37			
40----------------- Nishon	0-7	27-35	0.6-2.0	0.14-0.18	6.1-7.8	<2	Moderate	0.43	5	6	2-4
	7-21	40-60	0.06-0.2	0.14-0.18	7.4-8.4	<2	High------	0.37			
	21-60	35-55	<0.06	0.14-0.18	7.9-9.0	2-4	High------	0.37			
41----------------- Nobe	0-7	40-50	0.06-0.2	0.12-0.16	6.6-8.4	4-8	Moderate	0.43	5	6	.5-2
	7-60	35-60	<0.06	0.08-0.10	>7.8	>16	High------	0.43			
42----------------- Parshall	0-25	10-15	2.0-6.0	0.10-0.13	6.6-8.4	<2	Low--------	0.20	5	3	2-4
	25-60	10-15	2.0-6.0	0.07-0.12	7.4-8.4	<2	Low--------	0.20			
43----------------- Parshall	0-12	5-18	2.0-6.0	0.12-0.16	6.6-8.4	<2	Low--------	0.32	5	3	2-4
	12-47	5-18	2.0-6.0	0.11-0.15	7.4-8.4	<2	Low--------	0.32			
	47-60	20-30	0.06-0.2	0.16-0.20	7.4-8.4	<2	Moderate	0.43			
44*:											
Phillips---------	0-3	15-27	0.6-2.0	0.16-0.20	6.1-7.3	<2	Low--------	0.49	5	5	1-3
	3-15	35-45	0.06-0.2	0.14-0.18	6.6-8.4	<2	Moderate	0.43			
	15-25	25-40	0.06-0.2	0.14-0.18	7.4-8.4	<4	Moderate	0.43			
	25-60	20-35	<0.06	0.13-0.17	7.4-8.4	4-8	Moderate	0.43			
Elloam-----------	0-5	27-40	0.6-2.0	0.12-0.18	6.1-7.3	<2	Moderate	0.49	5	6	1-2
	5-12	35-45	<0.2	0.10-0.14	7.9-9.0	2-8	High------	0.37			
	12-20	30-45	<0.06	0.10-0.12	7.9-9.0	4-8	Moderate	0.43			
	20-60	25-35	<0.06	0.08-0.11	>7.8	8-16	Moderate	0.43			
45*. Riverwash											
46----------------- Savage	0-6	27-35	0.6-2.0	0.14-0.18	6.6-7.8	<2	Moderate	0.37	5	6	2-4
	6-15	35-45	0.06-0.2	0.14-0.18	7.4-8.4	2-8	High------	0.32			
	15-60	30-45	0.06-0.2	0.13-0.17	7.4-8.4	2-8	High------	0.32			
47, 48------------ Tally	0-6	5-15	2.0-6.0	0.10-0.12	6.6-7.8	<2	Low--------	0.20	5	3	1-3
	6-32	5-18	2.0-6.0	0.10-0.12	6.6-8.4	<2	Low--------	0.20			
	32-60	5-15	2.0-6.0	0.10-0.12	7.4-8.4	<2	Low--------	0.20			
49*:											
Tally------------	0-6	5-15	2.0-6.0	0.10-0.12	6.6-7.8	<2	Low--------	0.20	5	3	1-3
	6-32	5-18	2.0-6.0	0.10-0.12	6.6-8.4	<2	Low--------	0.20			
	32-60	5-15	2.0-6.0	0.10-0.12	7.4-8.4	<2	Low--------	0.20			
Lihen------------	0-9	10-20	6.0-20	0.13-0.15	6.1-7.8	<2	Low--------	0.20	5	3	1-2
	9-60	0-10	6.0-20	0.05-0.07	7.4-8.4	<2	Low--------	0.17			
50----------------- Telstad	0-5	18-27	0.6-2.0	0.16-0.20	6.6-7.8	<2	Low--------	0.43	5	6	1-3
	5-15	25-35	0.2-0.6	0.14-0.18	7.4-8.4	<2	Moderate	0.37			
	15-60	20-32	0.06-0.2	0.14-0.18	7.4-8.4	2-4	Moderate	0.37			
51*:											
Telstad----------	0-5	18-27	0.6-2.0	0.16-0.20	6.6-7.8	<2	Low--------	0.43	5	6	1-3
	5-15	25-35	0.2-0.6	0.14-0.18	7.4-8.4	<2	Moderate	0.37			
	15-60	20-32	0.06-0.2	0.14-0.18	7.4-8.4	2-4	Moderate	0.37			
Hillon-----------	0-8	20-27	0.6-2.0	0.18-0.20	7.4-8.4	<2	Low--------	0.37	5	4L	.5-2
	8-60	20-35	0.06-0.2	0.15-0.18	7.4-8.4	<2	Moderate	0.32			
52*:											
Thebo------------	0-2	50-65	<0.06	0.14-0.18	6.6-8.4	<2	High------	0.37	2	4	.5-2
	2-32	60-75	<0.06	0.12-0.16	7.4-9.0	<4	High------	0.37			
	32	---	---	---	---	---	----------	----			
Lisam------------	0-17	50-60	<0.2	0.14-0.18	6.6-8.4	2-4	High------	0.37	1	4	.5-1
	17	---	---	---	---	---	----------	----			

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
53---------------- Tinsley	0-3	5-15	2.0-6.0	0.06-0.09	6.6-7.8	<2	Low--------	0.17	2	5	.5-2
	3-60	0-10	6.0-20	0.01-0.03	6.6-8.4	<2	Low--------	0.10			
54, 55------------ Trembles	0-8	10-20	2.0-6.0	0.12-0.16	7.4-8.4	<2	Low--------	0.20	5	3	1-3
	8-48	8-15	2.0-6.0	0.11-0.15	7.4-8.4	<2	Low--------	0.20			
	48-60	8-15	2.0-6.0	0.10-0.14	7.4-8.4	<2	Low--------	0.20			
56, 57------------ Turner	0-10	10-20	0.6-2.0	0.12-0.16	6.1-7.8	<2	Low--------	0.24	3	3	2-4
	10-21	25-35	0.6-2.0	0.12-0.16	6.6-8.4	<2	Moderate	0.32			
	21-60	0-5	6.0-20	0.04-0.06	7.4-8.4	<2	Low--------	0.10			
58*, 59*:											
Turner-----------	0-10	10-20	0.6-2.0	0.12-0.16	6.1-7.8	<2	Low--------	0.24	3	3	2-4
	10-21	25-35	0.6-2.0	0.12-0.16	6.6-8.4	<2	Moderate	0.32			
	21-60	0-5	6.0-20	0.04-0.06	7.4-8.4	<2	Low--------	0.10			
Beaverton--------	0-4	10-20	0.6-2.0	0.07-0.10	6.1-7.8	<2	Low--------	0.17	2	3	1-3
	4-24	25-35	0.6-2.0	0.07-0.10	6.6-7.8	<2	Low--------	0.24			
	24-60	0-10	>6.0	0.04-0.06	7.4-8.4	<2	Low--------	0.15			
60*. Typic Fluvaquents											
61*. Typic Ustifluvents											
62*. Ustic Torrifluvents											
63*. Ustifluvents											
64---------------- Vanda Variant	0-8	40-60	0.06-0.2	0.14-0.18	7.9-8.4	<2	High-------	0.37	5	4	.5-2
	8-24	35-60	0.06-0.2	0.15-0.19	7.9-8.4	4-8	High-------	0.43			
	24-60	40-60	<0.06	0.11-0.13	7.9-8.4	4-8	High-------	0.37			
65*:											
Vanda Variant---	0-8	40-60	0.06-0.2	0.14-0.18	7.9-8.4	<2	High-------	0.37	5	4	.5-2
	8-24	35-60	0.06-0.2	0.15-0.19	7.9-8.4	4-8	High-------	0.43			
	24-60	40-60	<0.06	0.11-0.13	7.9-8.4	4-8	High-------	0.37			
Thebo------------	0-2	50-65	<0.06	0.14-0.18	6.6-8.4	<2	High-------	0.37	2	4	.5-2
	2-32	60-75	<0.06	0.12-0.16	7.4-9.0	<4	High-------	0.37			
	32	---	---	---	---	---	-----------	----			
Lisam------------	0-17	50-60	<0.2	0.14-0.18	6.6-8.4	2-4	High-------	0.37	1	4	.5-1
	17	---	---	---	---	---	-----------	----			
66*:											
Wabek------------	0-7	5-15	6.0-20	0.13-0.15	6.6-7.8	<2	Low--------	0.20	2	3	1-2
	7-19	5-15	6.0-20	0.11-0.15	6.6-7.8	<2	Low--------	0.10			
	19-60	0-10	>20	0.02-0.04	7.4-7.8	<2	Low--------	0.10			
Cabba------------	0-5	10-27	0.6-2.0	0.18-0.22	7.4-8.4	<4	Low--------	0.37	2	4L	.5-1
	5-18	15-35	0.6-2.0	0.14-0.18	7.4-8.4	2-8	Low--------	0.37			
	18	---	---	---	---	---	-----------	----			
Tinsley----------	0-3	5-15	2.0-6.0	0.06-0.09	6.6-7.8	<2	Low--------	0.17	2	5	.5-2
	3-60	0-10	6.0-20	0.01-0.03	6.6-8.4	<2	Low--------	0.10			
67*:											
Wabek------------	0-7	5-15	6.0-20	0.13-0.15	6.6-7.8	<2	Low--------	0.20	2	3	1-2
	7-19	5-15	6.0-20	0.11-0.15	6.6-7.8	<2	Low--------	0.10			
	19-60	0-10	>20	0.02-0.04	7.4-7.8	<2	Low--------	0.10			

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
67*:											
Tinsley----------	0-3	5-15	2.0-6.0	0.06-0.09	6.6-7.8	<2	Low--------	0.17	2	5	.5-2
	3-60	0-10	6.0-20	0.01-0.03	6.6-8.4	<2	Low--------	0.10			
68, 69----------- Williams	0-7	10-25	0.6-2.0	0.17-0.24	6.6-7.8	<2	Low--------	0.43	5	6	2-5
	7-12	24-35	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	0.37			
	12-60	18-35	0.06-0.2	0.15-0.18	7.4-8.4	<2	Moderate	0.37			
70*:											
Williams---------	0-7	10-25	0.6-2.0	0.17-0.24	6.6-7.8	<2	Low--------	0.43	5	6	2-5
	7-12	24-35	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	0.37			
	12-60	18-35	0.06-0.2	0.15-0.18	7.4-8.4	<2	Moderate	0.37			
Zahill-----------	0-7	20-27	0.6-2.0	0.16-0.20	7.4-8.4	<2	Low--------	0.43	5	4L	.5-2
	7-60	20-35	0.06-0.2	0.14-0.18	7.4-8.4	<2	Moderate	0.37			
71--------------- Zahill	0-5	20-27	0.6-2.0	0.16-0.20	7.4-8.4	<2	Low--------	0.43	5	4L	.5-2
	5-60	20-35	0.06-0.2	0.14-0.18	7.4-8.4	<2	Moderate	0.37			
72--------------- Zahill	0-3	20-27	0.6-2.0	0.16-0.20	7.4-8.4	<2	Low--------	0.43	5	4L	.5-2
	3-60	20-35	0.06-0.2	0.14-0.18	7.4-8.4	<2	Moderate	0.37			
73*:											
Zahill-----------	0-5	20-27	0.6-2.0	0.16-0.20	7.4-8.4	<2	Low--------	0.43	5	4L	.5-2
	5-60	20-35	0.06-0.2	0.14-0.18	7.4-8.4	<2	Moderate	0.37			
Cabba------------	0-5	10-27	0.6-2.0	0.18-0.22	7.4-8.4	<4	Low--------	0.37	2	4L	.5-1
	5-18	15-35	0.6-2.0	0.14-0.18	7.4-8.4	2-8	Low--------	0.37			
	18	---	---	---	---	---	-----------	-----			
Cambert----------	0-4	15-27	0.6-2.0	0.18-0.22	6.6-8.4	<2	Low--------	0.37	3	4L	.5-1
	4-24	18-35	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.37			
	24-30	18-35	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.32			
	30	---	---	---	---	---	-----------	-----			
74*:											
Zahill-----------	0-3	20-27	0.6-2.0	0.16-0.20	7.4-8.4	<2	Low--------	0.43	5	4L	.5-2
	3-60	20-35	0.06-0.2	0.14-0.18	7.4-8.4	<2	Moderate	0.37			
Cabba------------	0-5	10-27	0.6-2.0	0.18-0.22	7.4-8.4	<4	Low--------	0.37	2	4L	.5-1
	5-18	15-35	0.6-2.0	0.14-0.18	7.4-8.4	2-8	Low--------	0.37			
	18	---	---	---	---	---	-----------	-----			
Cambert----------	0-4	15-27	0.6-2.0	0.18-0.22	6.6-8.4	<2	Low--------	0.37	3	4L	.5-1
	4-24	18-35	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.37			
	24-30	18-35	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.32			
	30	---	---	---	---	---	-----------	-----			
75*:											
Zahill-----------	0-5	20-27	0.6-2.0	0.16-0.20	7.4-8.4	<2	Low--------	0.43	5	4L	.5-2
	5-60	20-35	0.06-0.2	0.14-0.18	7.4-8.4	<2	Moderate	0.37			
Tinsley----------	0-3	5-15	2.0-6.0	0.06-0.09	6.6-7.8	<2	Low--------	0.17	2	5	.5-2
	3-60	0-10	6.0-20	0.01-0.03	6.6-8.4	<2	Low--------	0.10			
76*:											
Zahill-----------	0-3	20-27	0.6-2.0	0.16-0.20	7.4-8.4	<2	Low--------	0.43	5	4L	.5-2
	3-60	20-35	0.06-0.2	0.14-0.18	7.4-8.4	<2	Moderate	0.37			
Tinsley----------	0-3	5-15	2.0-6.0	0.06-0.09	6.6-7.8	<2	Low--------	0.17	2	5	.5-2
	3-60	0-10	6.0-20	0.01-0.03	6.6-8.4	<2	Low--------	0.10			
77--------------- Zahl	0-7	15-25	0.6-2.0	0.17-0.22	6.6-7.8	<2	Moderate	0.43	5	6	2-4
	7-60	20-35	0.06-0.2	0.15-0.19	7.4-8.4	<2	Moderate	0.37			

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
78----------------- Zahl	0-6 6-60	15-25 20-35	0.6-2.0 0.06-0.2	0.17-0.22 0.15-0.19	6.6-7.8 7.4-8.4	<2 <2	Moderate Moderate	0.43 0.37	5	6	2-4

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "brief," "apparent," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
1 Adger	D	None	---	---	>6.0	---	---	>60	---	Low	High	High.
2*:												
Adger	D	None	---	---	>6.0	---	---	>60	---	Low	High	High.
Farnuf	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
3*:												
Adger	D	None	---	---	>6.0	---	---	>60	---	Low	High	High.
Nobe	D	None	---	---	>6.0	---	---	>60	---	Low	High	High.
4*. Badland												
5 Banks	A	Frequent	Brief	Apr-Jun	>6.0	---	---	>60	---	Low	High	Low.
6 Blanchard	A	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
7*:												
Bowbells	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
Bowbells	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
8 Bowdoin	D	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
9*:												
Cabba	D	None	---	---	>6.0	---	---	10-20	Soft	Moderate	High	Low.
Cambert	C	None	---	---	>6.0	---	---	20-36	Soft	Moderate	High	Low.
10*:												
Cabba	D	None	---	---	>6.0	---	---	10-20	Soft	Moderate	High	Low.
Cambert	C	None	---	---	>6.0	---	---	20-36	Soft	Moderate	High	Low.
Cherry	C	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
11*:												
Cabba	D	None	---	---	>6.0	---	---	10-20	Soft	Moderate	High	Low.
Cambert	C	None	---	---	>6.0	---	---	20-36	Soft	Moderate	High	Low.
Rock outcrop.												

See footnotes at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
12 Cherry	C	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
13** Dimmick	D	None	---	---	+1-2.0	Apparent	Apr-Jul	>60	---	Moderate	High	Low.
14 Dooley	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
15 Evanston	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
16 Farland	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
17*:												
Farland	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
Cherry	C	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
18 Farnuf	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
19*, 20*. Fluvaquents												
21 Glendive	B	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
22 Grail	C	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
23 Harlem	C	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
24 Havre	B	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
25*:												
Havre	B	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
Glendive	B	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
26 Havrelon	B	Occasional	Brief	Apr-Jun	>6.0	---	---	>60	---	Moderate	High	Low.
27 Havrelon	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
28*:												
Havrelon	B	Occasional	Brief	Apr-Jun	>6.0	---	---	>60	---	Moderate	High	Low.
Trembles	B	Occasional	Brief	Apr-Jun	>6.0	---	---	>60	---	Moderate	High	Low.

See footnotes at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In				
29*:												
Havrelon----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
Trembles----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
30, 31------------ Hillon	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
32*, 33*:												
Hillon------------	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
Tinsley-----------	A	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
34**-------------- Lallie	D	Frequent----	Brief-----	Apr-Jun	+1-1.5	Apparent	Apr-Jun	>60	---	High-----	High-----	High.
35---------------- Lihen	A	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
36---------------- Lohler	C	Occasional	Brief-----	Apr-Jun	>6.0	---	---	>60	---	Moderate	High-----	Low.
37---------------- Lohler	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
38---------------- Martinsdale	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
39**-------------- McKenzie	D	None--------	---	---	+1-1.0	Perched	Apr-Jun	>60	---	Moderate	High-----	Moderate.
40**-------------- Nishon	D	None--------	---	---	+1-3.0	Perched	Apr-Jun	>60	---	Moderate	High-----	Low.
41---------------- Nobe	D	Occasional	Brief-----	Apr-Jun	>6.0	---	---	>60	---	Low------	High-----	High.
42---------------- Parshall	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
43---------------- Parshall	B	None--------	---	---	3.5-5.0	Perched	Apr-Sep	>60	---	Moderate	High-----	Low.
44*:												
Phillips----------	C	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Moderate.
Elloam------------	D	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	High.
45*. Riverwash												
46---------------- Savage	C	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Moderate.

See footnotes at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
47, 48------------ Tally	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High------	Low.
49*:												
Tally------------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High------	Low.
Lihen------------	A	None---------	---	---	>6.0	---	---	>60	---	Low-------	High------	Low.
50--------------- Telstad	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	High------	Low.
51*:												
Telstad----------	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	High------	Low.
Hillon-----------	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	High------	Low.
52*:												
Thebo------------	D	None---------	---	---	>6.0	---	---	20-40	Soft	Low-------	High------	Moderate.
Lisam------------	D	None---------	---	---	>6.0	---	---	10-20	Soft	Low-------	High------	Low.
53--------------- Tinsley	A	None---------	---	---	>6.0	---	---	>60	---	Low-------	High------	Low.
54--------------- Trembles	B	Occasional	Brief------	Apr-Jun	>6.0	---	---	>60	---	Moderate	High------	Low.
55--------------- Trembles	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High------	Low.
56, 57----------- Turner	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High------	Low.
58*, 59*:												
Turner-----------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High------	Low.
Beaverton--------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High------	Low.
60*. Typic Fluvaquents												
61*. Typic Ustifluvents												
62*. Ustic Torrifluvents												
63*. Ustifluvents												
64--------------- Vanda Variant	D	None---------	---	---	>6.0	---	---	>60	---	Low-------	High------	Moderate.

See footnotes at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In				
65*:												
Vanda Variant----	D	None---------	---	---	>6.0	---	---	>60	---	Low------	High-----	Moderate.
Thebo------------	D	None---------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Moderate.
Lisam------------	D	None---------	---	---	>6.0	---	---	10-20	Soft	Low------	High-----	Low.
66*:												
Wabek------------	A	None---------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
Cabba------------	D	None---------	---	---	>6.0	---	---	10-20	Soft	Moderate	High-----	Low.
Tinsley----------	A	None---------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
67*:												
Wabek------------	A	None---------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
Tinsley----------	A	None---------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
68, 69------------ Williams	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
70*:												
Williams---------	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
Zahill-----------	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
71, 72------------ Zahill	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
73*, 74*:												
Zahill-----------	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
Cabba------------	D	None---------	---	---	>6.0	---	---	10-20	Soft	Moderate	High-----	Low.
Cambert----------	C	None---------	---	---	>6.0	---	---	20-36	Soft	Moderate	High-----	Low.
75*, 76*:												
Zahill-----------	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
Tinsley----------	A	None---------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
77, 78------------ Zahl	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.

*See description of the map unit for composition and behavior characteristics of the map unit.

**In the "High water table--Depth" column, a plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

TABLE 14.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates a taxadjunct to the series. See text for a description of those characteristics of the taxadjunct that are outside the range of the series]

Soil name	Family or higher taxonomic class
Adger	Fine, montmorillonitic Leptic Natriborolls
Banks	Sandy, mixed, frigid Typic Ustifluvents
*Beaverton	Loamy-skeletal, mixed Typic Argiborolls
Blanchard	Mixed, frigid Typic Ustipsamments
*Bowbells	Fine-loamy, mixed Pachic Argiborolls
Bowdoin	Very-fine, montmorillonitic, frigid Udorthentic Chromusterts
Cabba	Loamy, mixed (calcareous), frigid, shallow Typic Ustorthents
Cambert	Fine-silty, mixed, frigid Typic Ustochrepts
Cherry	Fine-silty, mixed, frigid Typic Ustochrepts
Dimmick	Fine, montmorillonitic, frigid Typic Haplaquolls
Dooley	Fine-loamy, mixed Typic Argiborolls
Elloam	Fine, montmorillonitic Borollic Natrargids
Evanston	Fine-loamy, mixed Aridic Argiborolls
Farland	Fine-silty, mixed Typic Argiborolls
Farnuf	Fine-loamy, mixed Typic Argiborolls
Fluvaquents	Fluvaquents
Glendive	Coarse-loamy, mixed (calcareous), frigid Ustic Torrifluvents
Grail	Fine, montmorillonitic Pachic Argiborolls
Harlem	Fine, montmorillonitic (calcareous), frigid Ustic Torrifluvents
Havre	Fine-loamy, mixed (calcareous), frigid Ustic Torrifluvents
Havrelon	Fine-loamy, mixed (calcareous), frigid Typic Ustifluvents
Hillon	Fine-loamy, mixed (calcareous), frigid Ustic Torriorthents
Lallie	Fine, montmorillonitic (calcareous), frigid Typic Fluvaquents
Lihen	Sandy, mixed Entic Haploborolls
Lisam	Clayey, montmorillonitic (calcareous), frigid, shallow Ustic Torriorthents
Lohler	Fine, montmorillonitic (calcareous), frigid Typic Ustifluvents
Martinsdale	Fine-loamy, mixed Typic Argiborolls
*McKenzie	Fine, montmorillonitic (calcareous), frigid Typic Haplaquepts
Nishon	Fine, montmorillonitic, frigid Typic Albaqualfs
Nobe	Fine, montmorillonitic (calcareous), frigid Ustic Torriorthents
Parshall	Coarse-loamy, mixed Pachic Haploborolls
Phillips	Fine, montmorillonitic Borollic Paleargids
Savage	Fine, montmorillonitic Typic Argiborolls
Tally	Coarse-loamy, mixed Typic Haploborolls
Telstad	Fine-loamy, mixed Aridic Argiborolls
Thebo	Very-fine, montmorillonitic, frigid Udorthentic Chromusterts
Tinsley	Sandy-skeletal, mixed, frigid Typic Ustorthents
Trembles	Coarse-loamy, mixed (calcareous), frigid Typic Ustifluvents
Turner	Fine-loamy over sandy or sandy-skeletal, mixed Typic Argiborolls
Typic Fluvaquents	Typic Fluvaquents
Typic Ustifluvents	Typic Ustifluvents
Ustic Torrifluvents	Ustic Torrifluvents
Ustifluvents	Ustifluvents
Vanda Variant	Fine, montmorillonitic (calcareous), frigid Ustic Torriorthents
Wabek	Sandy-skeletal, mixed Entic Haploborolls
Williams	Fine-loamy, mixed Typic Argiborolls
Zahill	Fine-loamy, mixed (calcareous), frigid Typic Ustorthents
Zahl	Fine-loamy, mixed Entic Haploborolls

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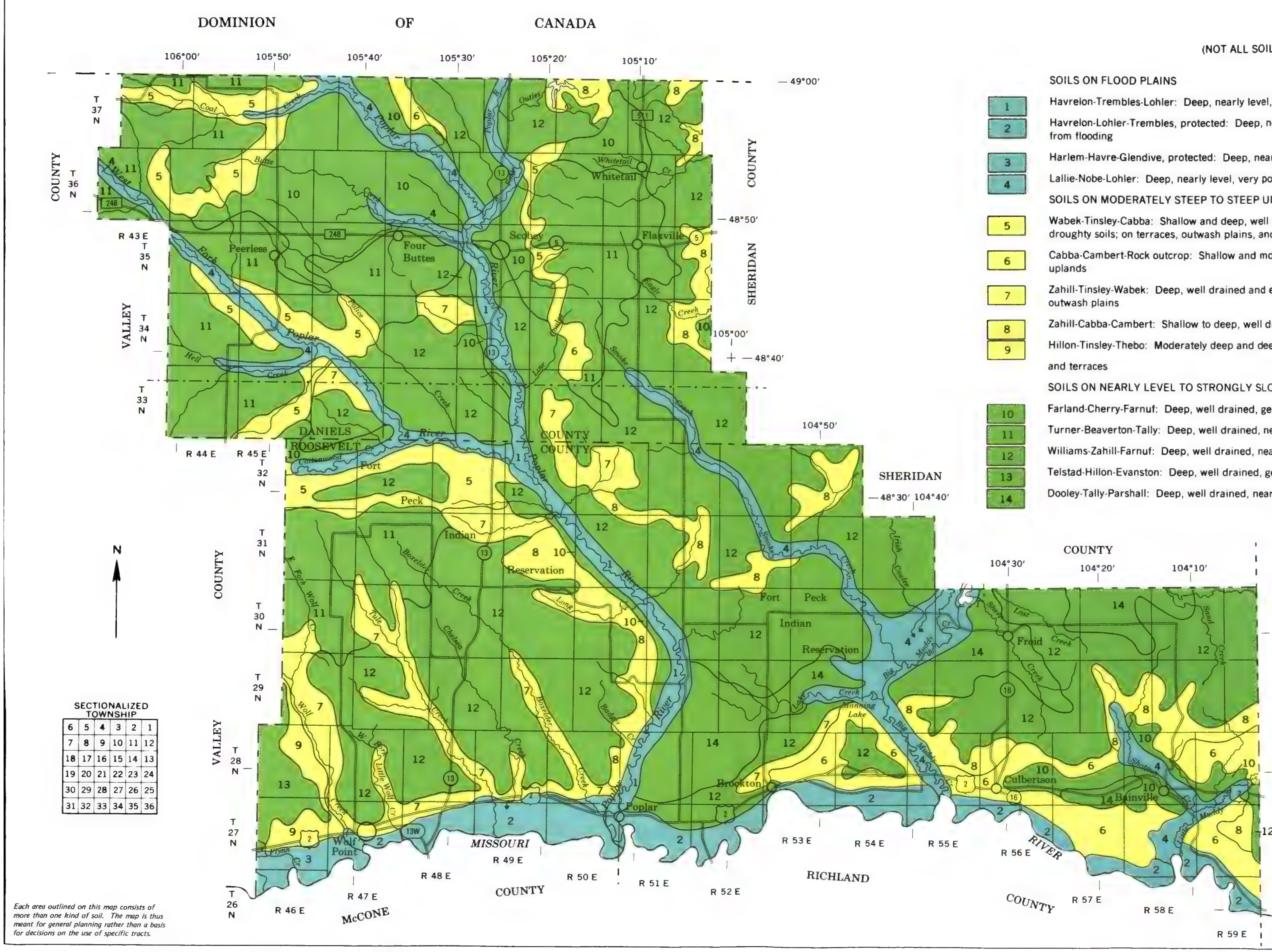


LEGEND

(NOT ALL SOIL UNITS OCCUR IN BOTH COUNTIES)

SOILS ON FLOOD PLAINS

- **1** Havrelon-Trembles-Lohler: Deep, nearly level, well drained and moderately well drained, moist soils that are subject to flooding
- **2** Havrelon-Lohler-Trembles, protected: Deep, nearly level, well drained and moderately well drained, moist soils that are protected from flooding
- **3** Harlem-Havre-Glendive, protected: Deep, nearly level, well drained, dry soils that are protected from flooding
- **4** Lallie-Nobe-Lohler: Deep, nearly level, very poorly drained and moderately well drained soils that are subject to flooding

SOILS ON MODERATELY STEEP TO STEEP UPLANDS, TERRACES, AND OUTWASH PLAINS

- **5** Wabek-Tinsley-Cabba: Shallow and deep, well drained and excessively drained, moderately steep to steep, droughty and very droughty soils; on terraces, outwash plains, and uplands
- **6** Cabba-Cambert-Rock outcrop: Shallow and moderately deep, well drained, moderately steep to steep soils, and Rock outcrop; on uplands
- **7** Zahill-Tinsley-Wabek: Deep, well drained and excessively drained, moderately steep to steep soils; on uplands, terraces, and outwash plains
- **8** Zahill-Cabba-Cambert: Shallow to deep, well drained, moderately steep to steep soils; on uplands
- **9** Hillon-Tinsley-Thebo: Moderately deep and deep, well drained and excessively drained, moderately steep to steep soils; on uplands and terraces

SOILS ON NEARLY LEVEL TO STRONGLY SLOPING UPLANDS, FANS, AND TERRACES

- **10** Farland-Cherry-Farnuf: Deep, well drained, gently sloping to moderately sloping soils; on fans, terraces, and foot slopes
- **11** Turner-Beaverton-Tally: Deep, well drained, nearly level to strongly sloping, droughty soils; on fans, terraces, and foot slopes
- **12** Williams-Zahill-Farnuf: Deep, well drained, nearly level to moderately sloping, moist soils; on uplands and fans
- **13** Telstad-Hillon-Evanston: Deep, well drained, gently sloping to moderately sloping, dry soils; on uplands and fans
- **14** Dooley-Tally-Parshall: Deep, well drained, nearly level to moderately sloping soils; on uplands and terraces

Compiled 1983

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
UNITED STATES DEPARTMENT OF INTERIOR
BUREAU OF INDIAN AFFAIRS
STATE LAND AND INVESTMENTS DEPARTMENT
IN COOPERATION WITH
MONTANA AGRICULTURE EXPERIMENT STATION

GENERAL SOIL MAP

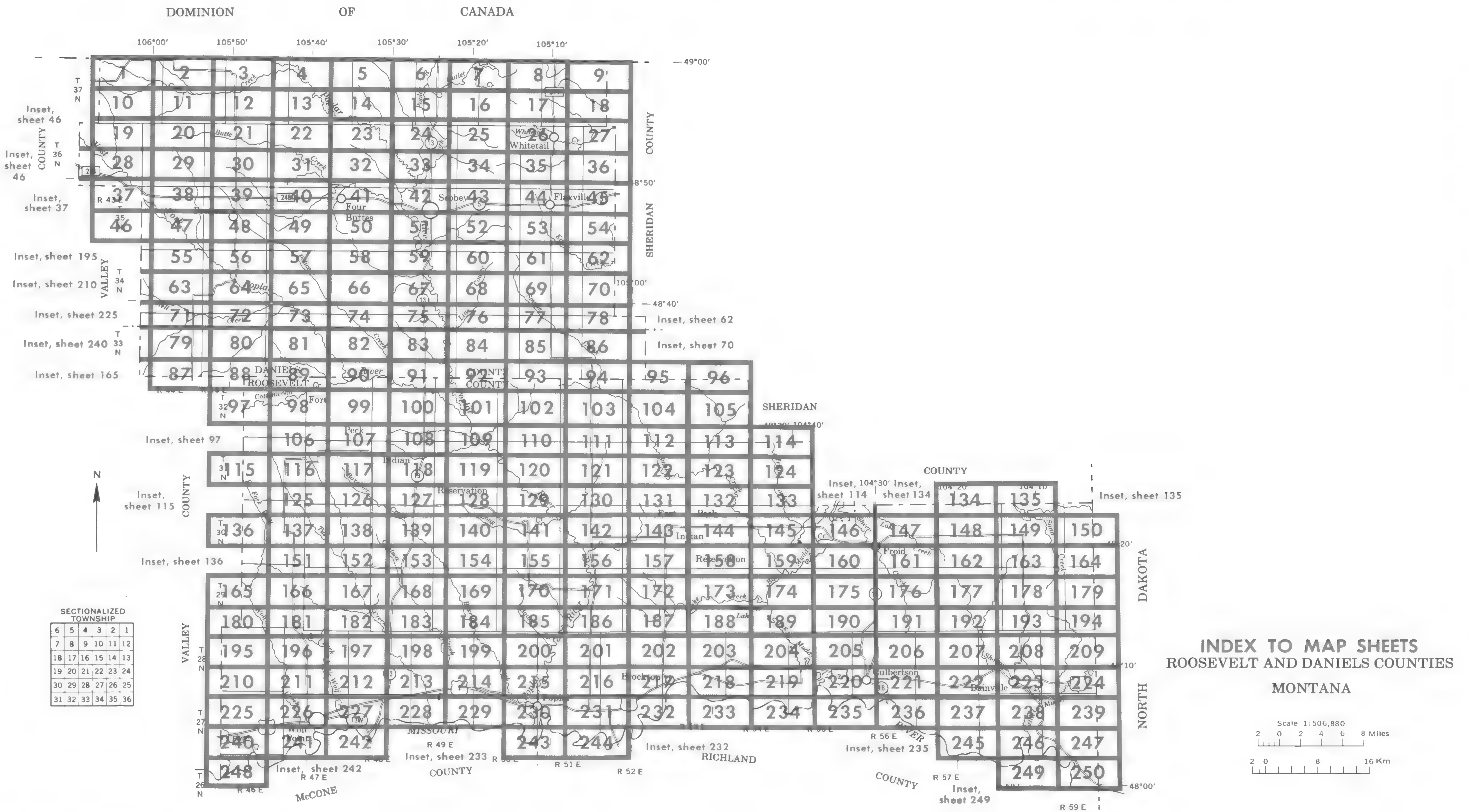
ROOSEVELT AND DANIELS COUNTIES

MONTANA

Scale 1:506,880

2 0 2 4 6 8 Miles

2 0 8 16 Km



INDEX TO MAP SHEETS
ROOSEVELT AND DANIELS COUNTIES
MONTANA

SOIL LEGEND

SYMBOL	NAME
1	Adger silty clay loam, 1 to 8 percent slopes
2	Adger-Farnuf complex, 1 to 8 percent slopes
3	Adger-Nobe complex, 1 to 4 percent slopes
4	Badland
5	Banks loam, 0 to 2 percent slopes
6	Blanchard loamy fine sand, 4 to 25 percent slopes
7	Bowbells silt loams, 0 to 4 percent slopes
8	Bowdoin clay, protected, 0 to 2 percent slopes
9	Cabba-Cambert silt loams, 15 to 45 percent slopes
10	Cabba-Cambert-Cherry silt loams, 8 to 15 percent slopes
11	Cabba-Cambert-Rock outcrop complex, 15 to 45 percent slopes
12	Cherry silt loam, 2 to 8 percent slopes
13	Dimmick silty clay, 0 to 1 percent slopes
14	Dooley sandy loam, 0 to 4 percent slopes
15	Evanston loam, 2 to 8 percent slopes
16	Farland silt loam, 2 to 8 percent slopes
17	Farland-Cherry silt loams, 2 to 8 percent slopes
18	Farnuf loam, 2 to 8 percent slopes
19	Fluvaquents, ponded, 0 to 1 percent slopes
20	Fluvaquents, saline, 0 to 2 percent slopes
21	Glendive fine sandy loam, protected, 0 to 2 percent slopes
22	Grail silty clay loam, 0 to 4 percent slopes
23	Harlem silty clay loam, protected, 0 to 2 percent slopes
24	Havre silt loam, protected, 0 to 2 percent slopes
25	Havre-Glendive complex, protected, 0 to 2 percent slopes
26	Havrelon loam, 0 to 2 percent slopes
27	Havrelon silt loam, protected, 0 to 2 percent slopes
28	Havrelon-Trembles complex, 0 to 2 percent slopes
29	Havrelon-Trembles complex, protected, 0 to 2 percent slopes
30	Hillon loam, 8 to 15 percent slopes
31	Hillon loam, 15 to 45 percent slopes
32	Hillon-Tinsley complex, 8 to 15 percent slopes
33	Hillon-Tinsley complex, 15 to 45 percent slopes
34	Lallie silty clay, saline, 0 to 2 percent slopes
35	Lihen sandy loam, 2 to 8 percent slopes
36	Lohler silty clay, 0 to 2 percent slopes
37	Lohler silty clay, protected, 0 to 2 percent slopes
38	Martinsdale loam, 1 to 8 percent slopes
39	McKenzie clay loam, 0 to 2 percent slopes
40	Nishon clay loam, 0 to 2 percent slopes
41	Nobe silty clay, flooded, 0 to 2 percent slopes
42	Parshall sandy loam, 0 to 4 percent slopes
43	Parshall sandy loam, silty substratum, 0 to 4 percent slopes
44	Phillips-Elloam clay loams, 2 to 8 percent slopes
45	Riverwash
46	Savage clay loam, 2 to 8 percent slopes
47	Tally sandy loam, 2 to 8 percent slopes
48	Tally sandy loam, 8 to 15 percent slopes
49	Tally-Lihen sandy loams, 1 to 8 percent slopes
50	Telstad loam, 2 to 8 percent slopes
51	Telstad-Hillon loams, 2 to 8 percent slopes
52	Thebo-Lisam complex, 15 to 45 percent slopes
53	Tinsley very gravelly sandy loam, 15 to 45 percent slopes
54	Trembles find sandy loam, 0 to 2 percent slopes
55	Trembles fine sandy loam, protected, 0 to 2 percent slopes
56	Turner sandy loam, 0 to 2 percent slopes
57	Turner sandy loam, 2 to 8 percent slopes
58	Turner-Beaverton complex, 2 to 8 percent slopes
59	Turner-Beaverton complex, 8 to 15 percent slopes
60	Typic Fluvaquents, 0 to 2 percent slopes
61	Typic Ustifluvents, 0 to 2 percent slopes
62	Ustic Torrifluvents, 0 to 2 percent slopes
63	Ustifluvents, saline, 0 to 2 percent slopes
64	Vanda Variant silty clay, 4 to 10 percent slopes
65	Vanda Variant-Thebo-Lisam complex, 4 to 15 percent slopes
66	Wabek-Cabba-Tinsley complex, 15 to 45 percent slopes
67	Wabek-Tinsley complex, 8 to 15 percent slopes
68	Williams loam, 0 to 2 percent slopes
69	Williams loam, 2 to 8 percent slopes
70	Williams-Zahill loams, 2 to 8 percent slopes
71	Zahill loam, 8 to 15 percent slopes
72	Zahill loam, 15 to 45 percent slopes
73	Zahill-Cabba-Cambert complex, 8 to 15 percent slopes
74	Zahill-Cabba-Cambert complex, 15 to 45 percent slopes
75	Zahill-Tinsley complex, 8 to 15 percent slopes
76	Zahill-Tinsley complex, 15 to 45 percent slopes
77	Zahl loam, 2 to 8 percent slopes
78	Zahl loam, 8 to 15 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label) — Hedley Airstrip

- Small airport, airfield, park, oilfield, cemetery, or flood pool — FLOOD POOL LINE

*** Sewage Lagoon — sewage lagoon

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate — 21
- Federal — 173
- State — 28
- County, farm or ranch — 1283

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small — water, w

** PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) — Indian Mound
- Located object (label) — Tower
- Tank (label) — Gas
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) — CANAL
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial — water, w
- Intermittent — int, i

MISCELLANEOUS WATER FEATURES

- * Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- * Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — CnB, WaC2

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown) — S

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- * Rock outcrop (includes sandstone and shale)
- * Saline spot
- * Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- ** Stony spot, very stony spot

* Each symbol represents an area up to 2 acres.

** Each symbol represents 10 acres or less.

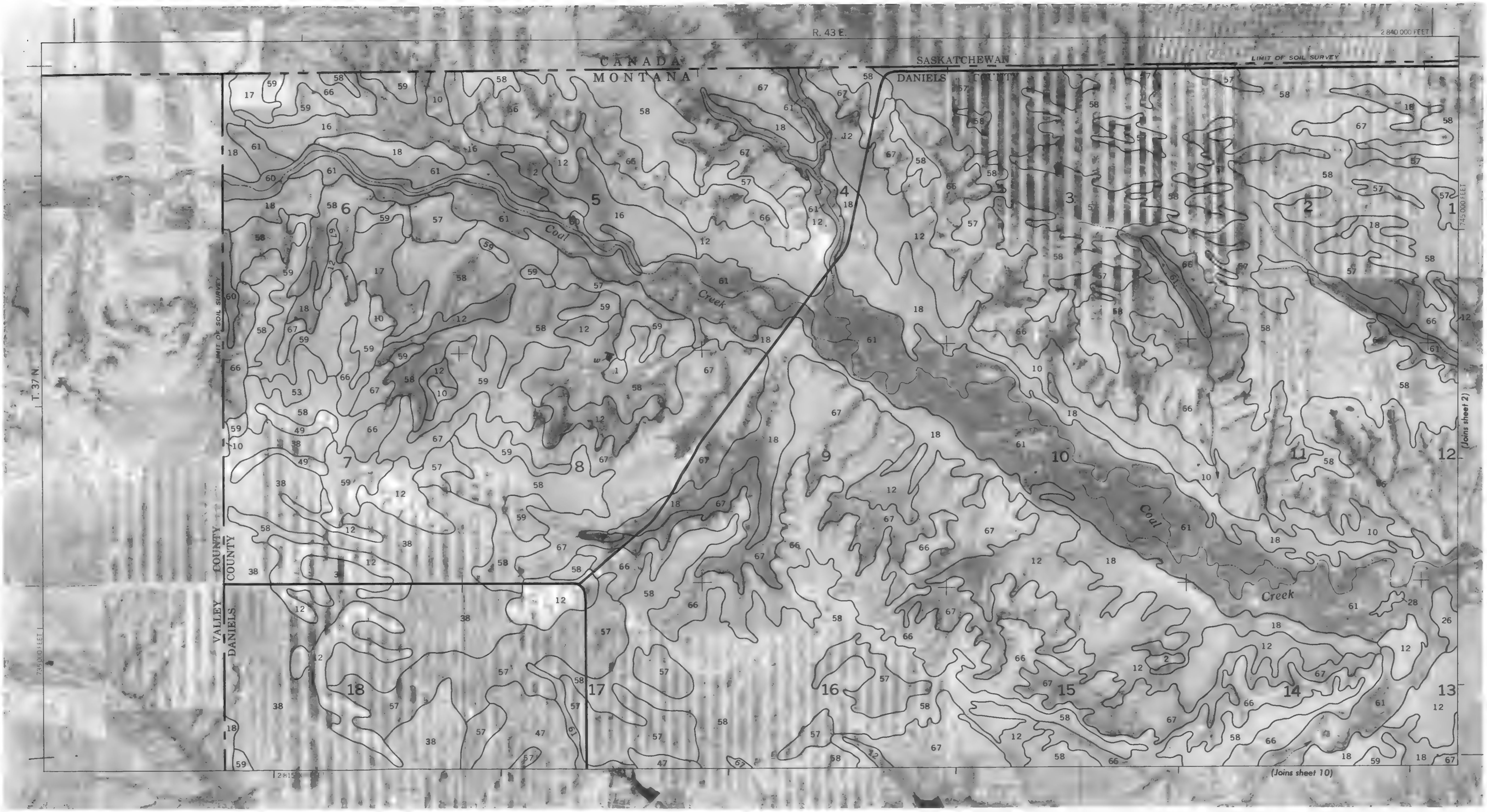
*** Use standard boundary symbol.

1

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 1

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

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3

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ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 3

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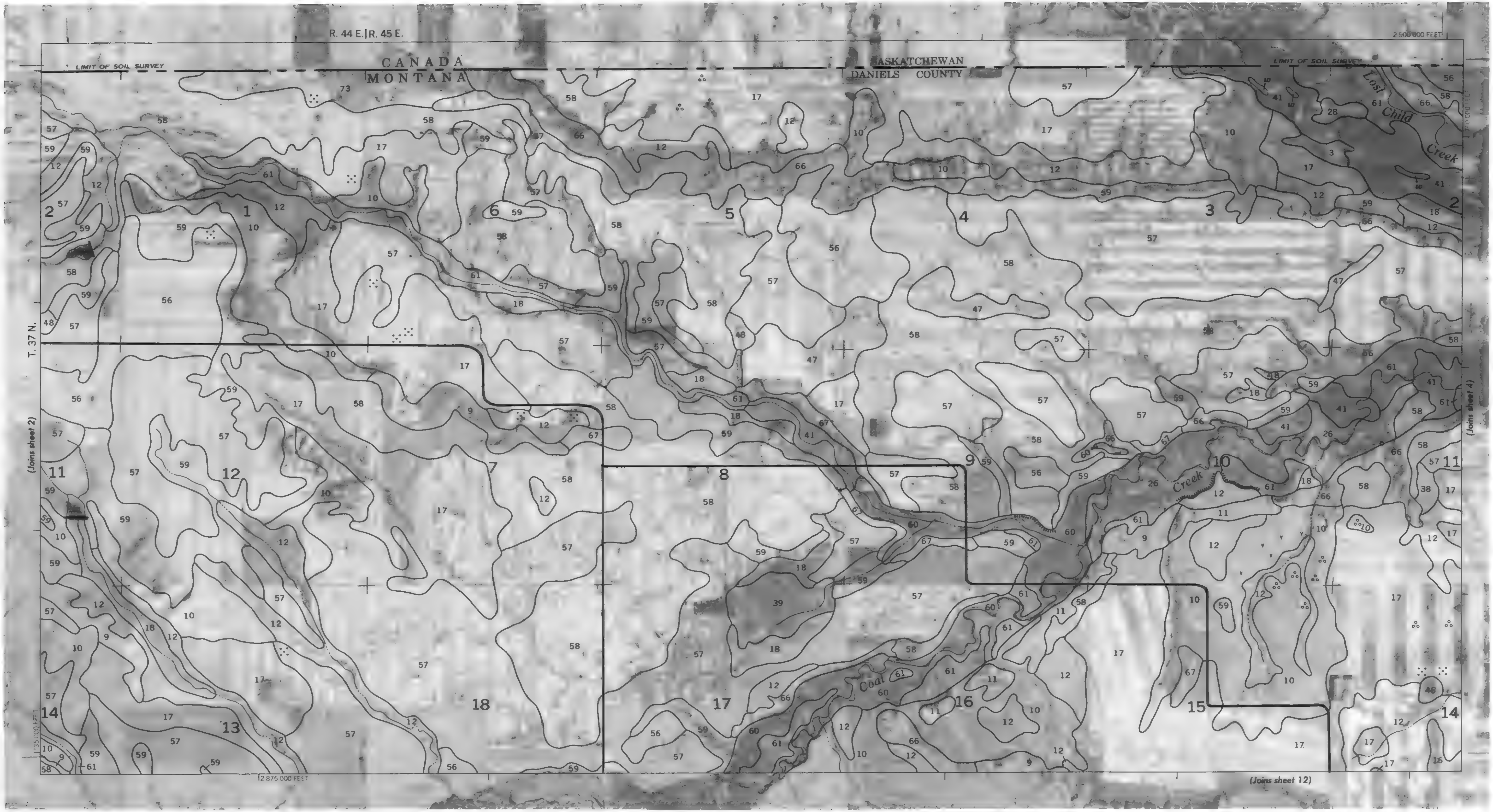

1 ¾ ½ ¼ 0 1 2 Miles

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Scale 1:24 000

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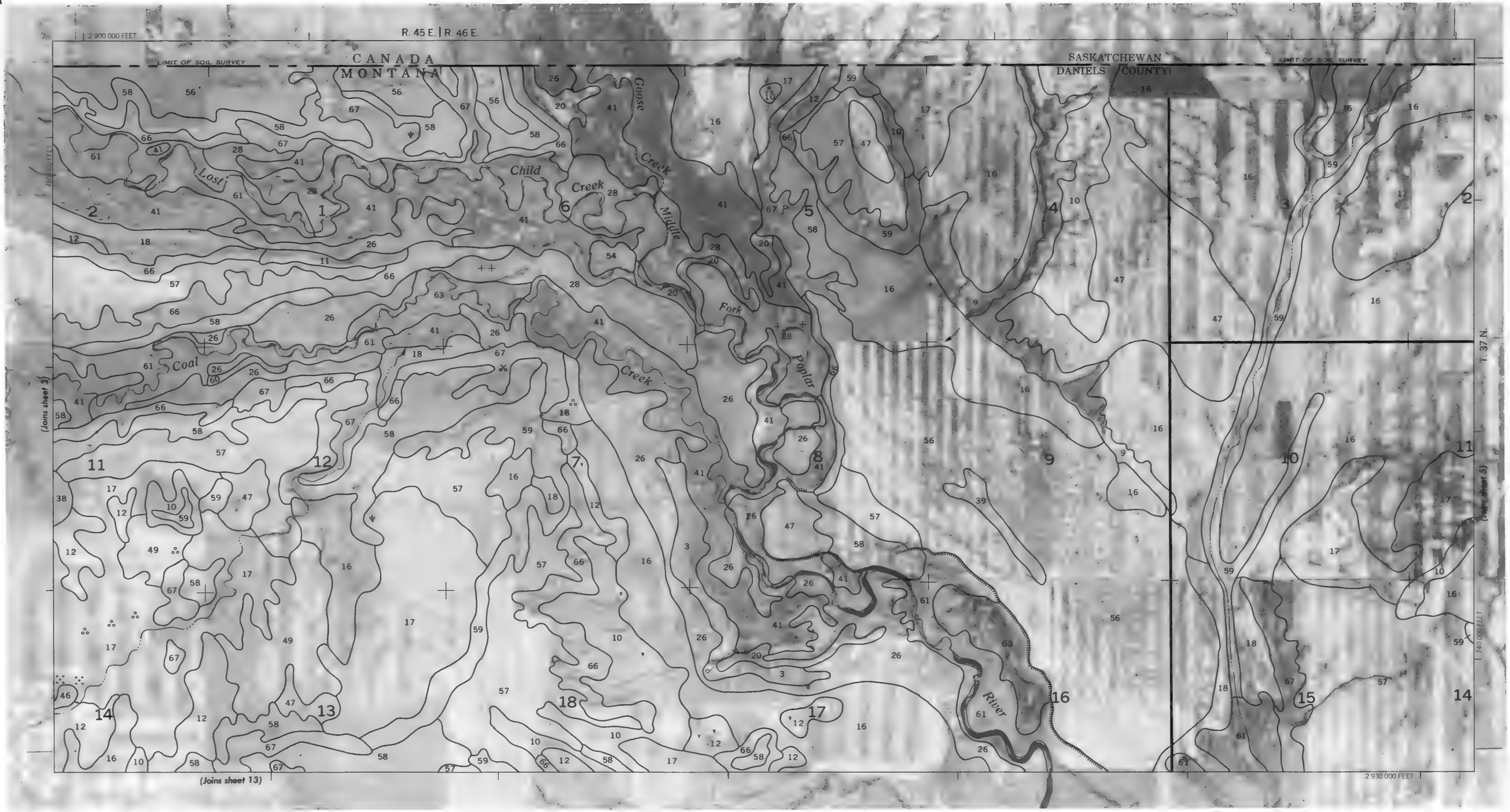
ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 4



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

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ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 5

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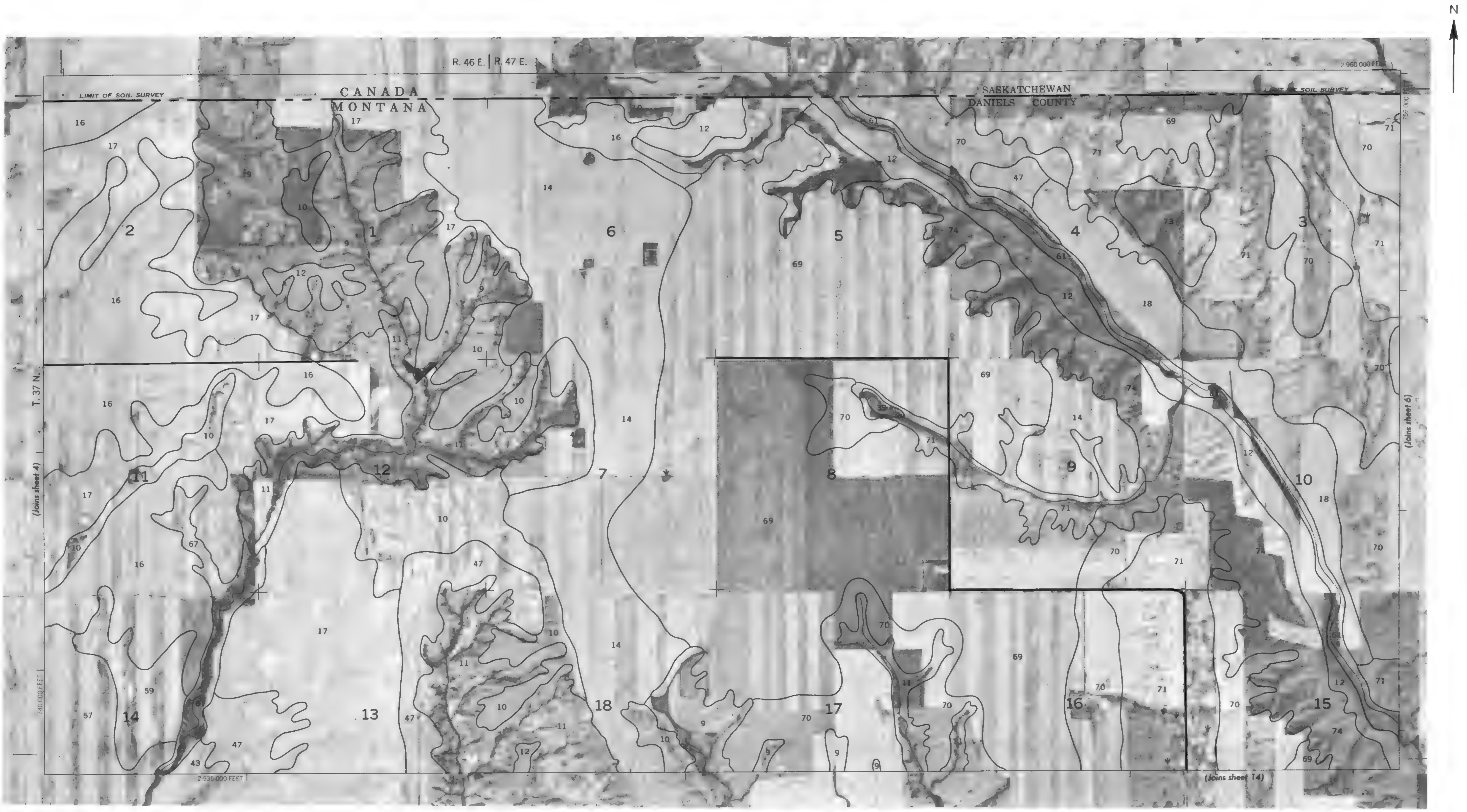

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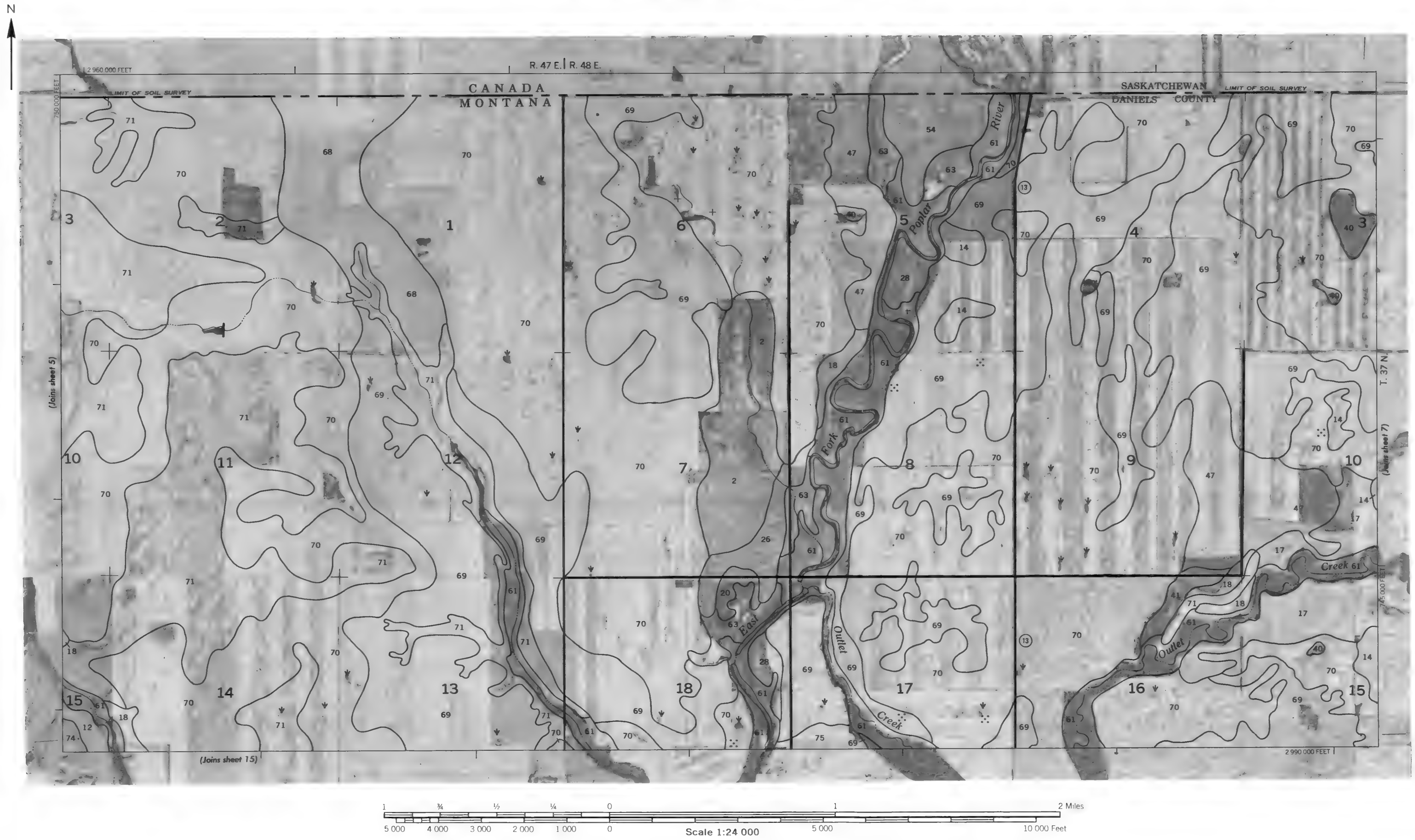
Scale 1:24 000



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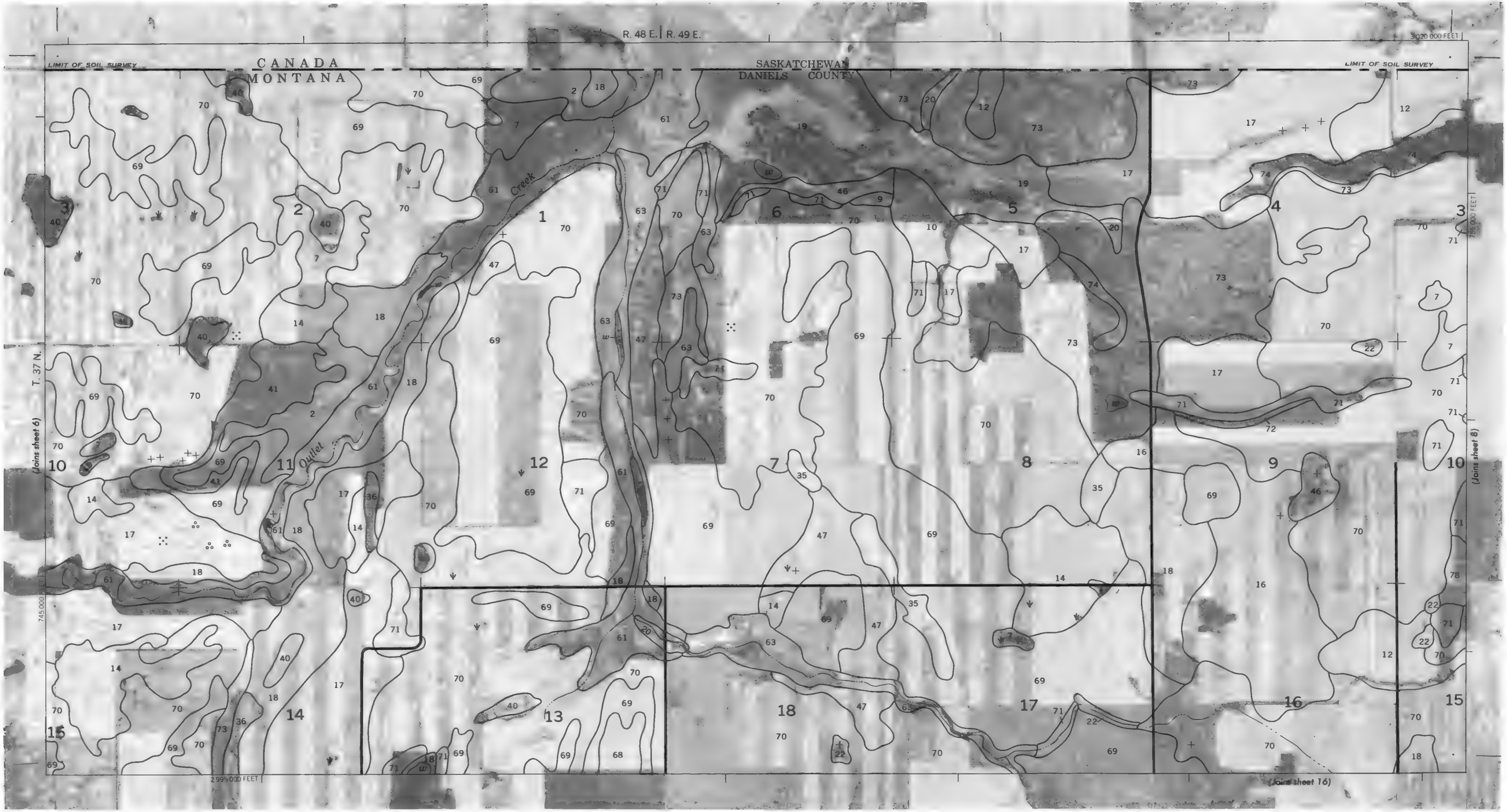

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Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 7

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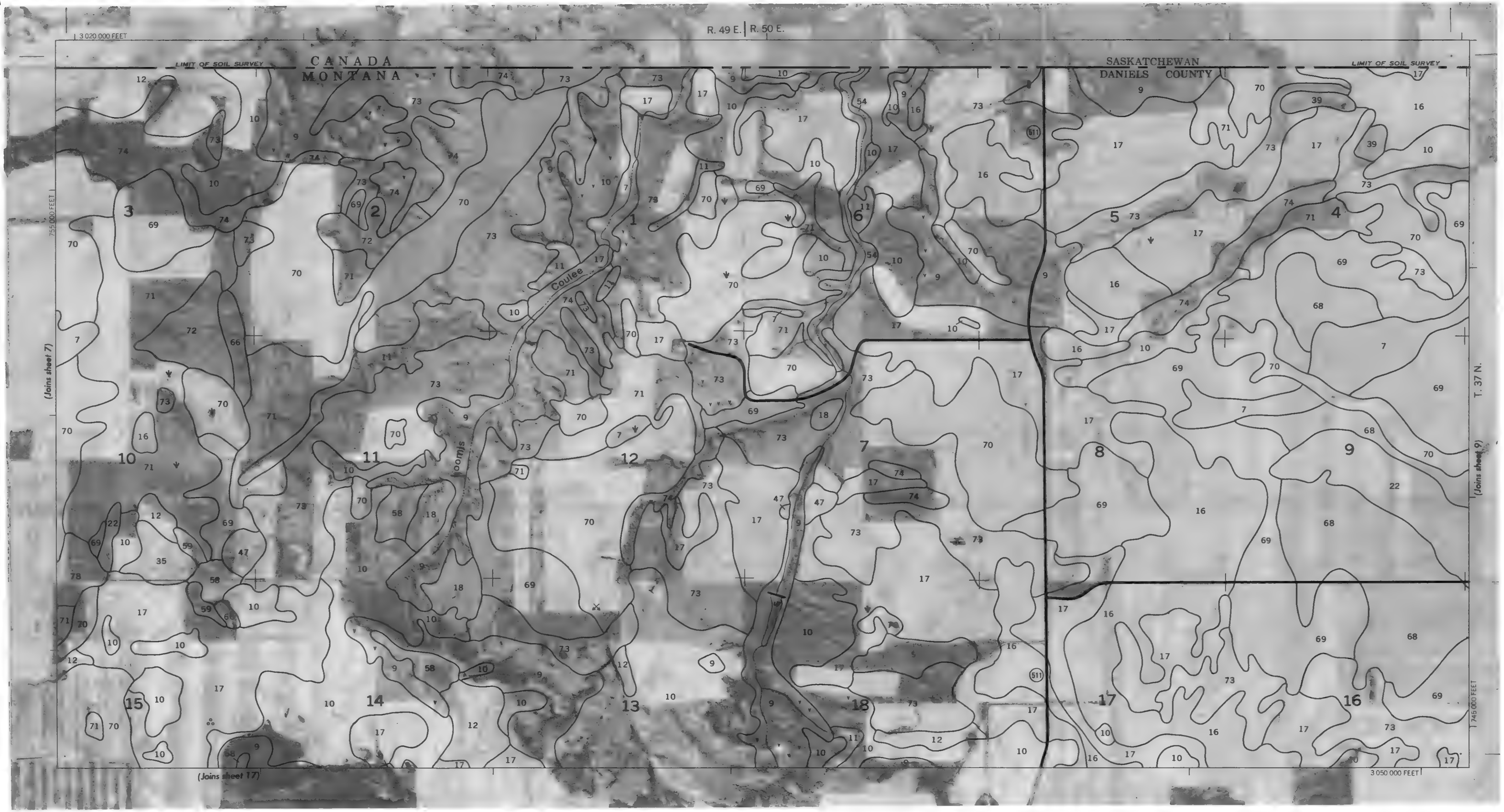

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

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9

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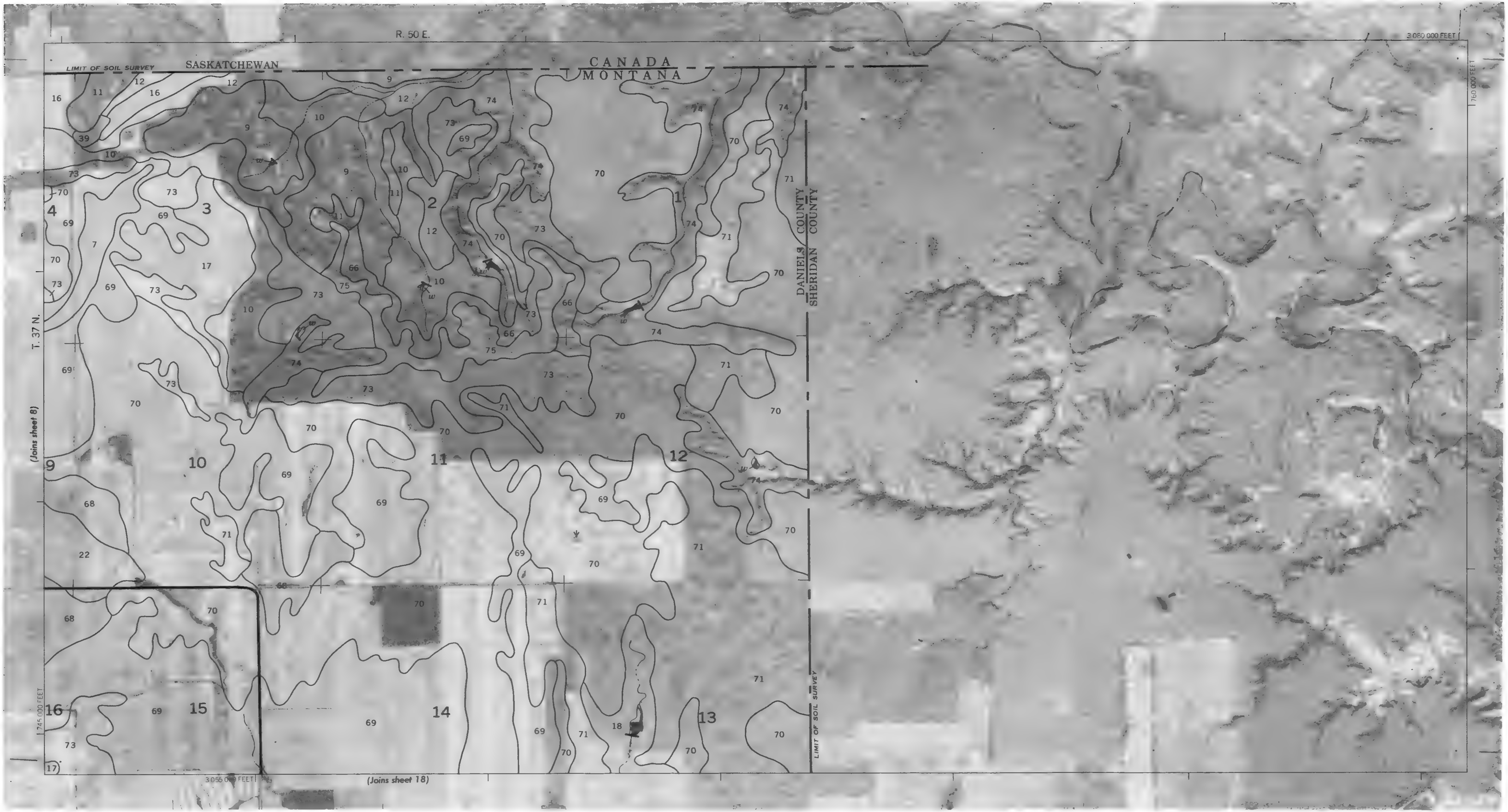

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

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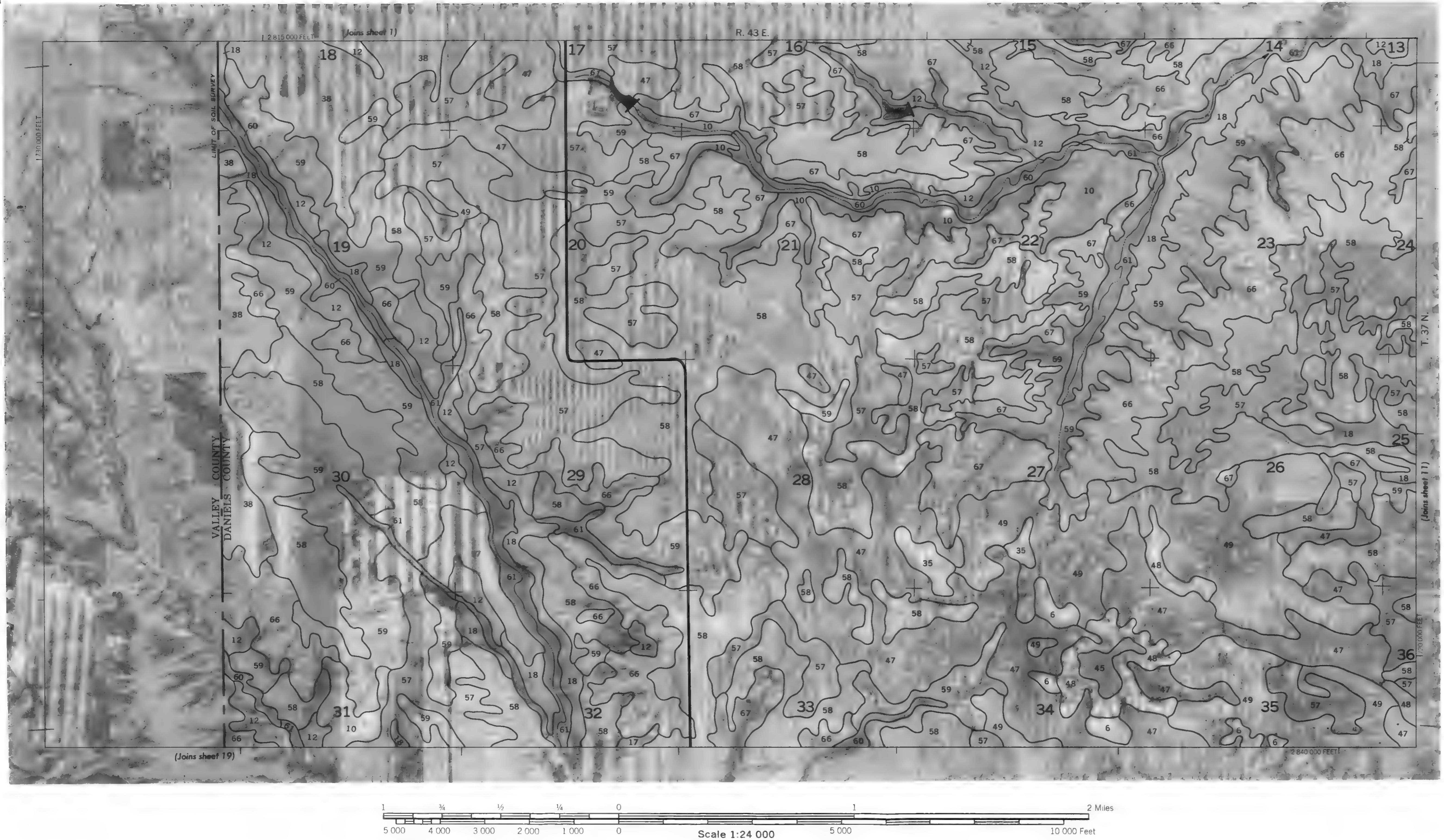
ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 10



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ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 10

11

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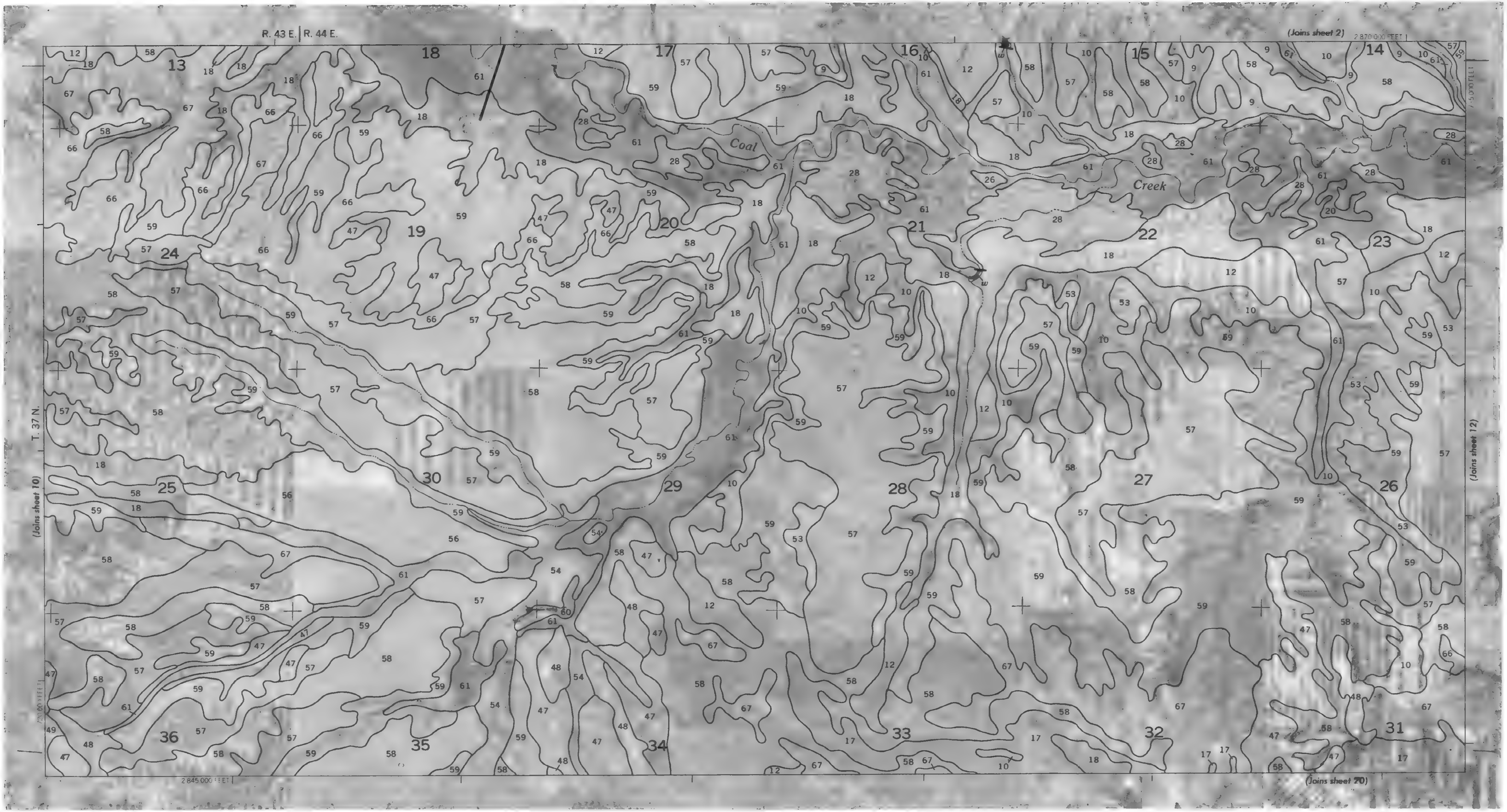

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Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 11

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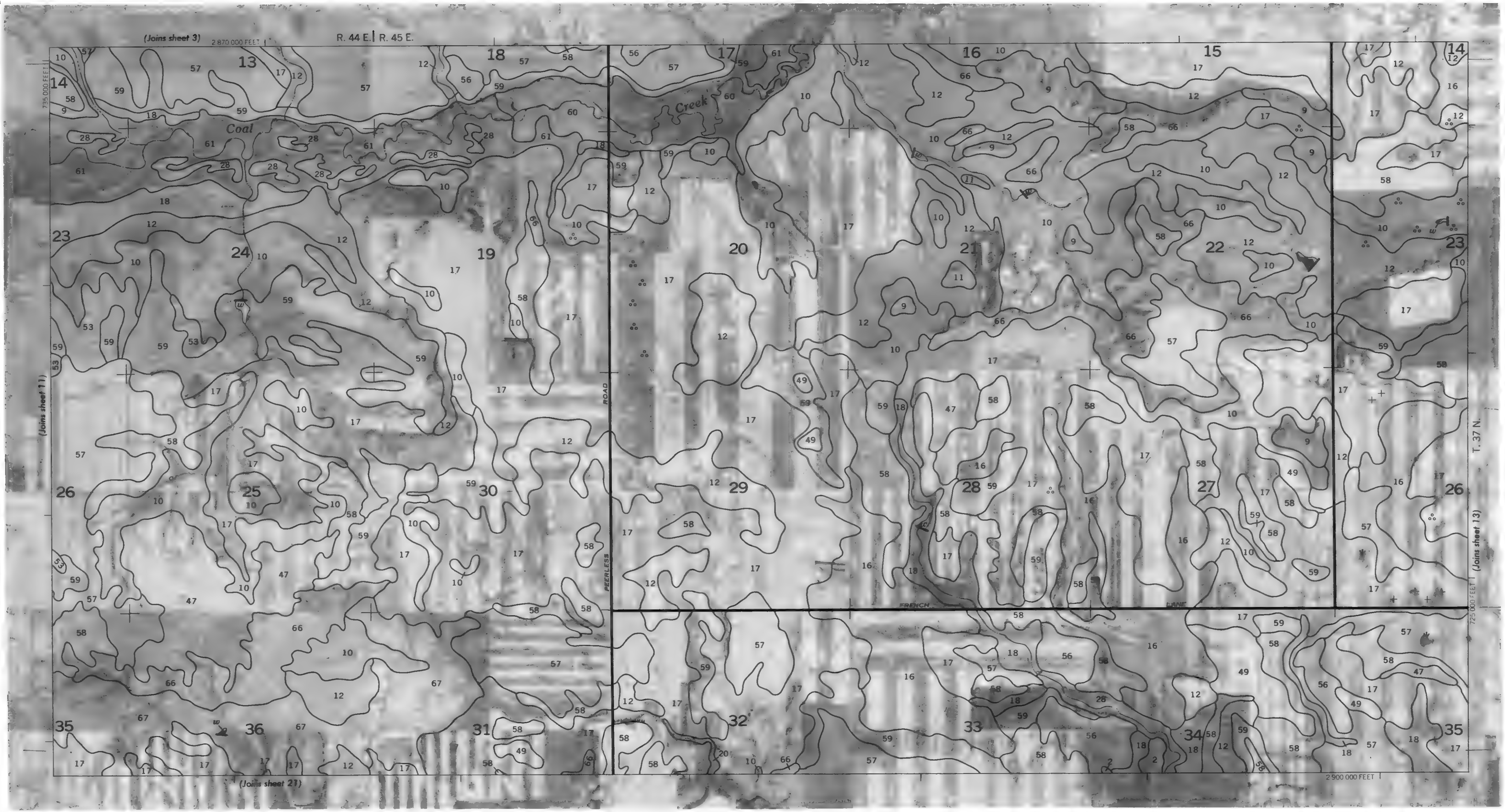

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Scale 1:24 000

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ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 13

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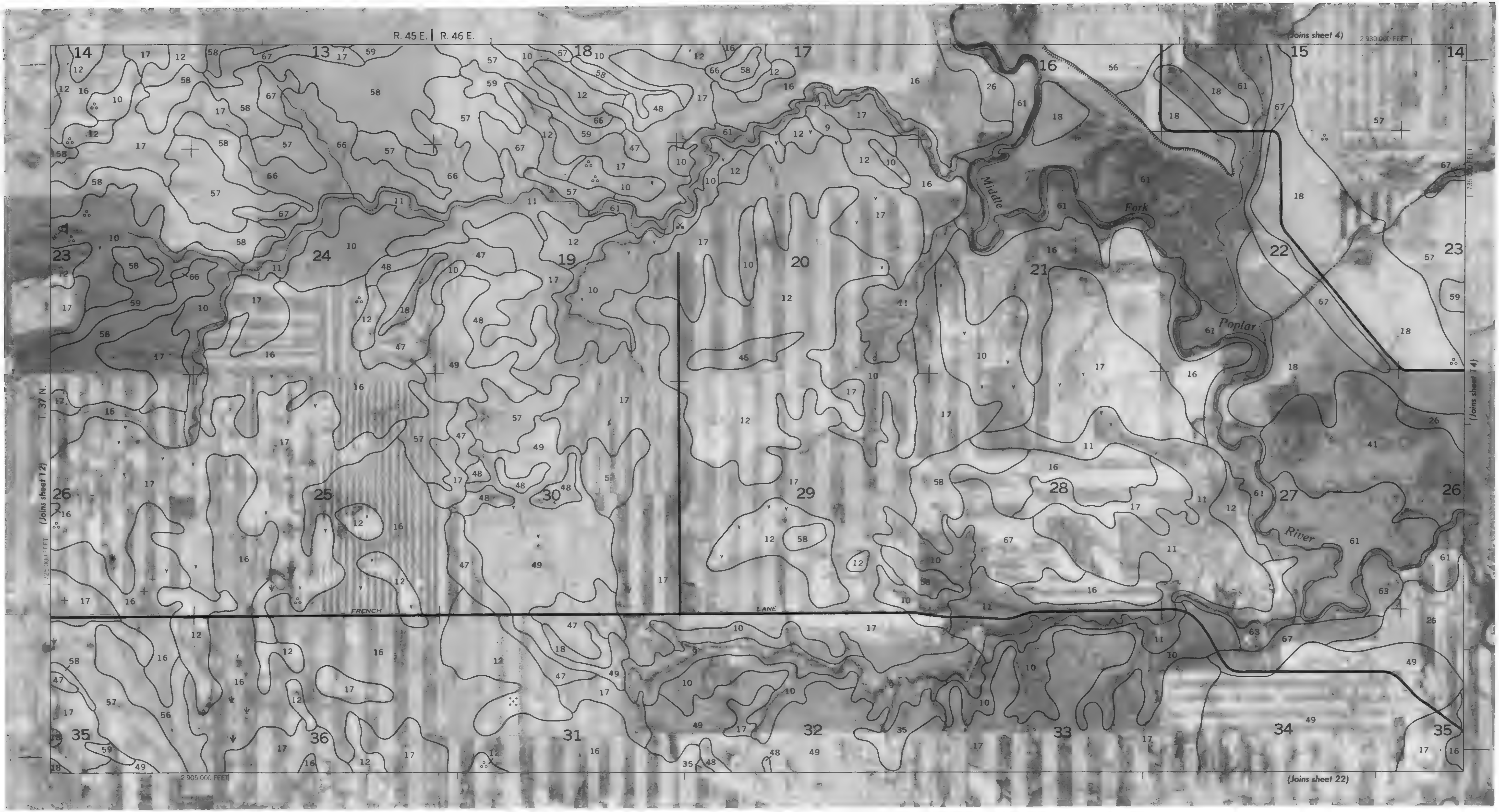

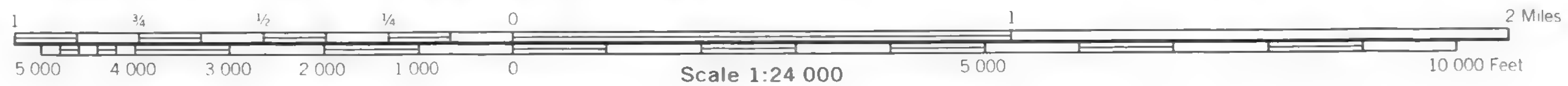

Scale 1:24 000

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1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

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15

N

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 15

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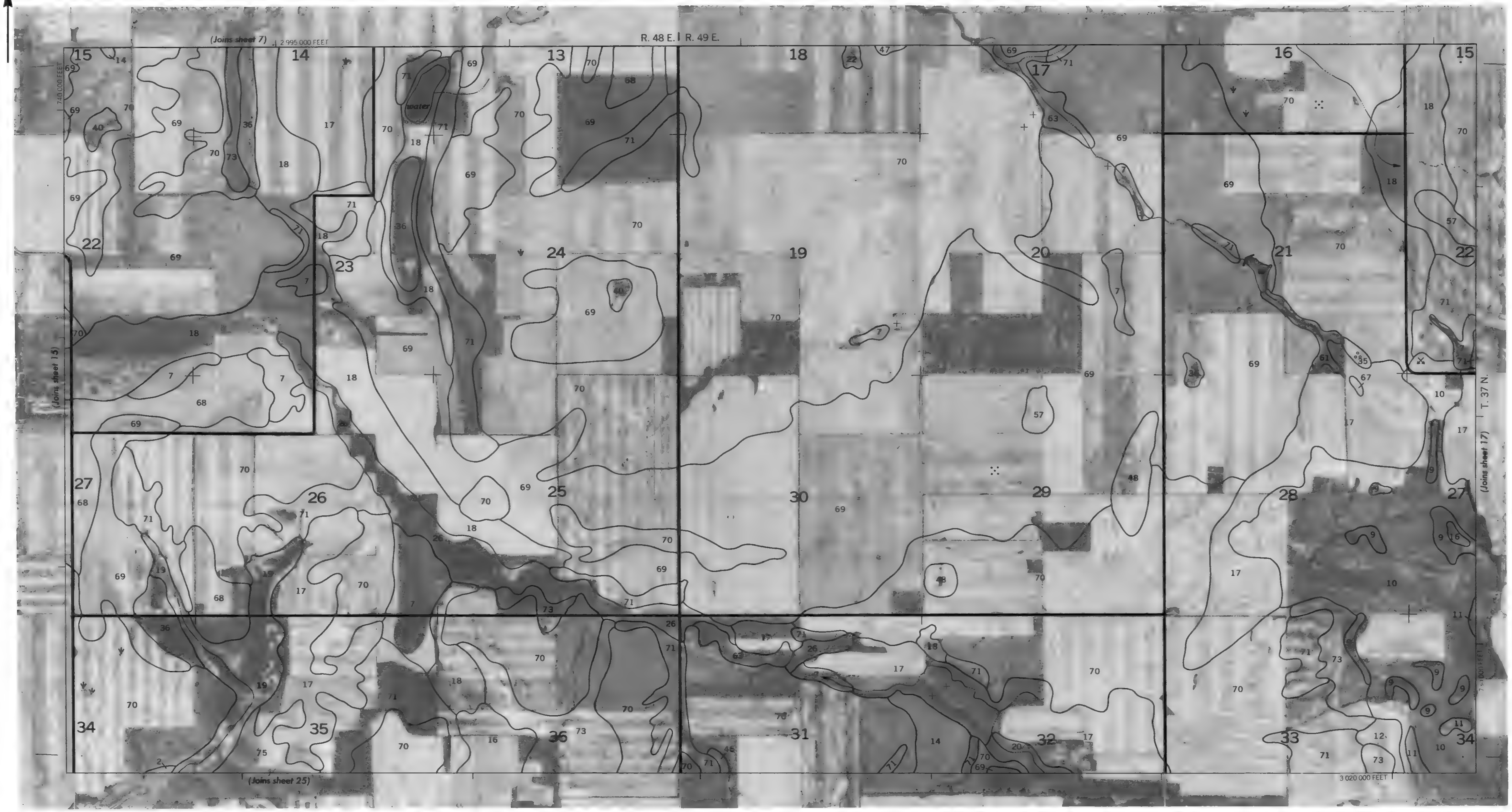
ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 16

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

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ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 16

17

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ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 17

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1 ¾ ½ ¼ 0 1 2 Miles

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ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 18

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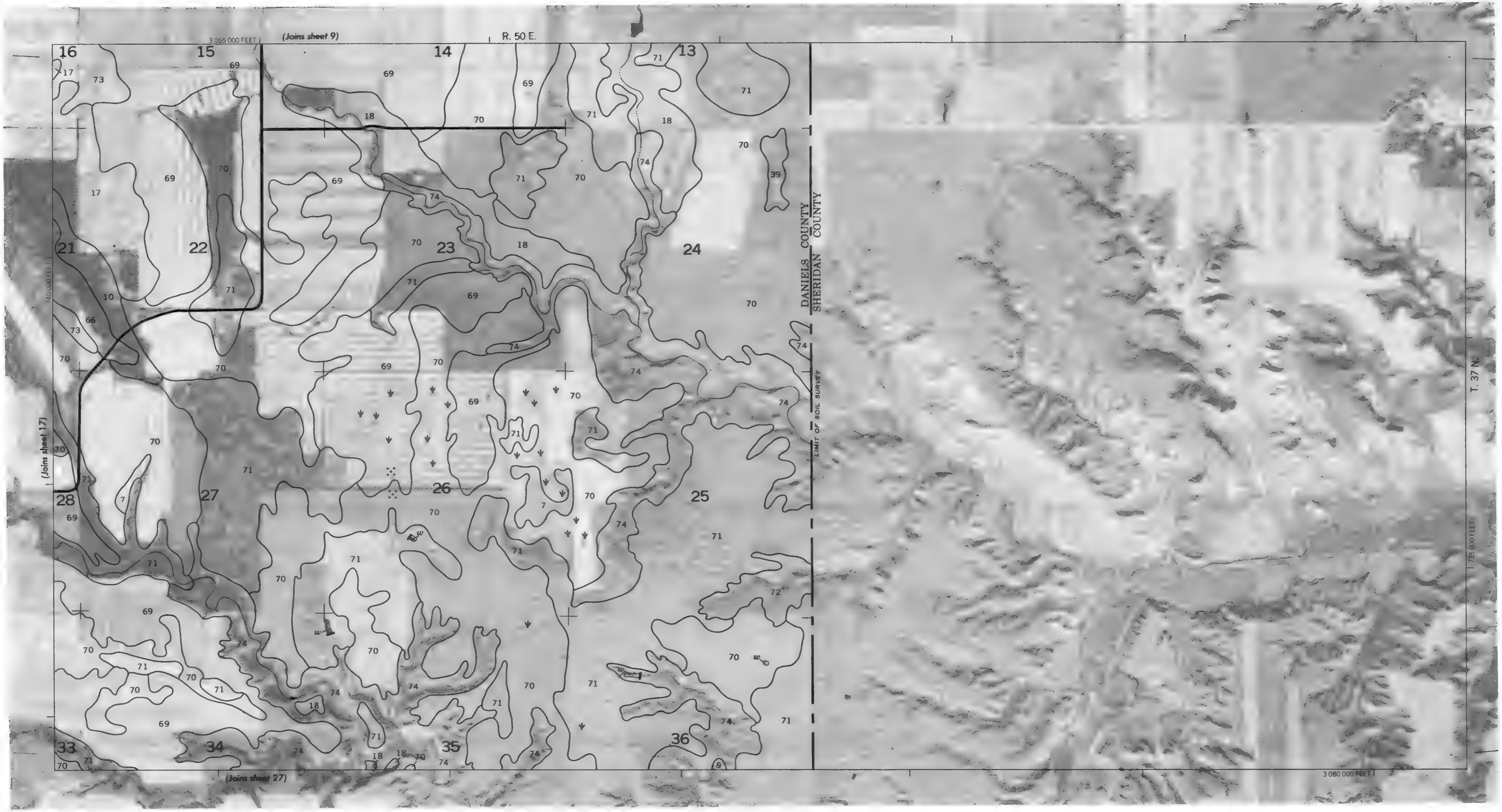

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

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ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 18

N

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

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ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 20

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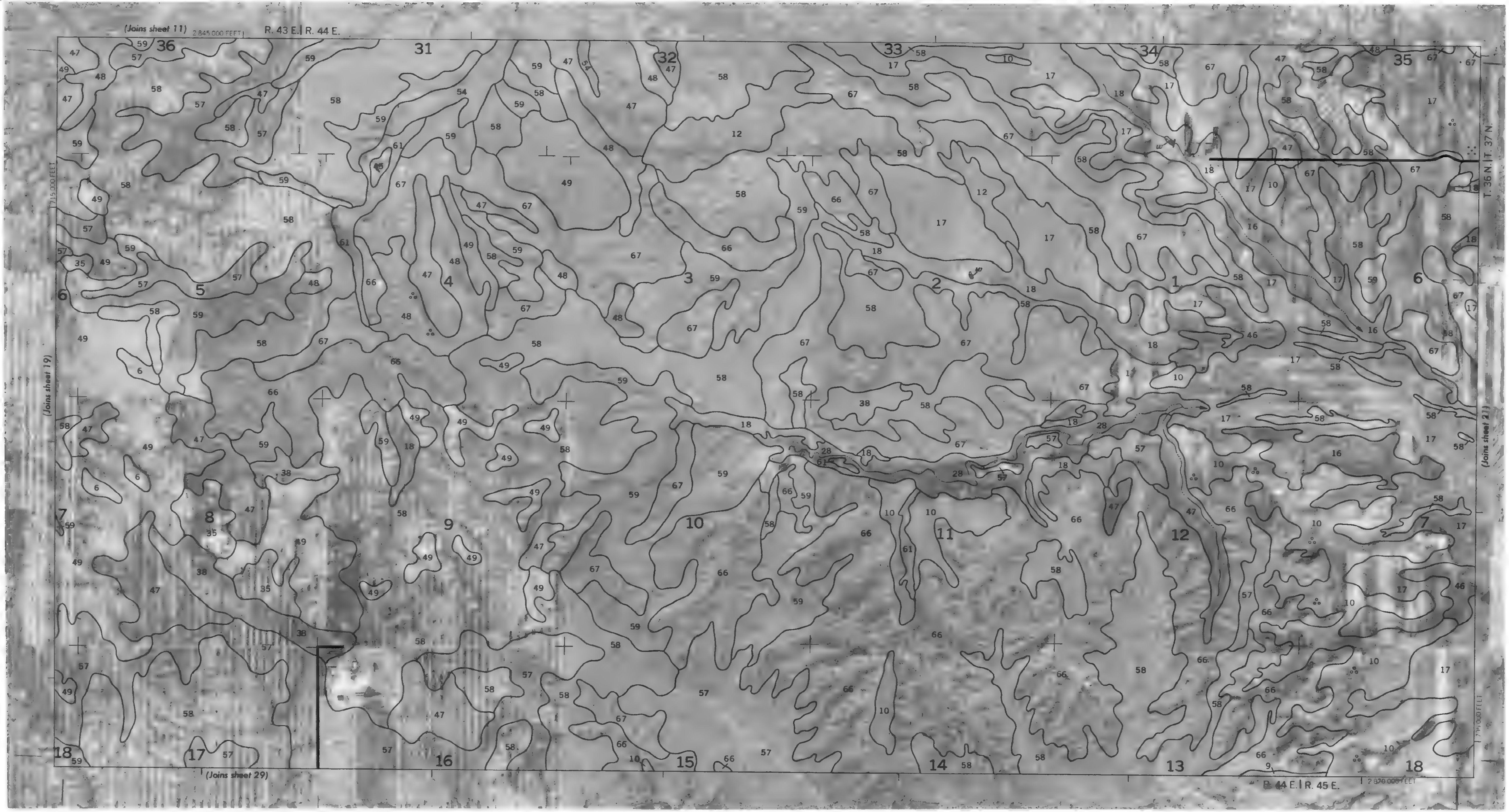

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned

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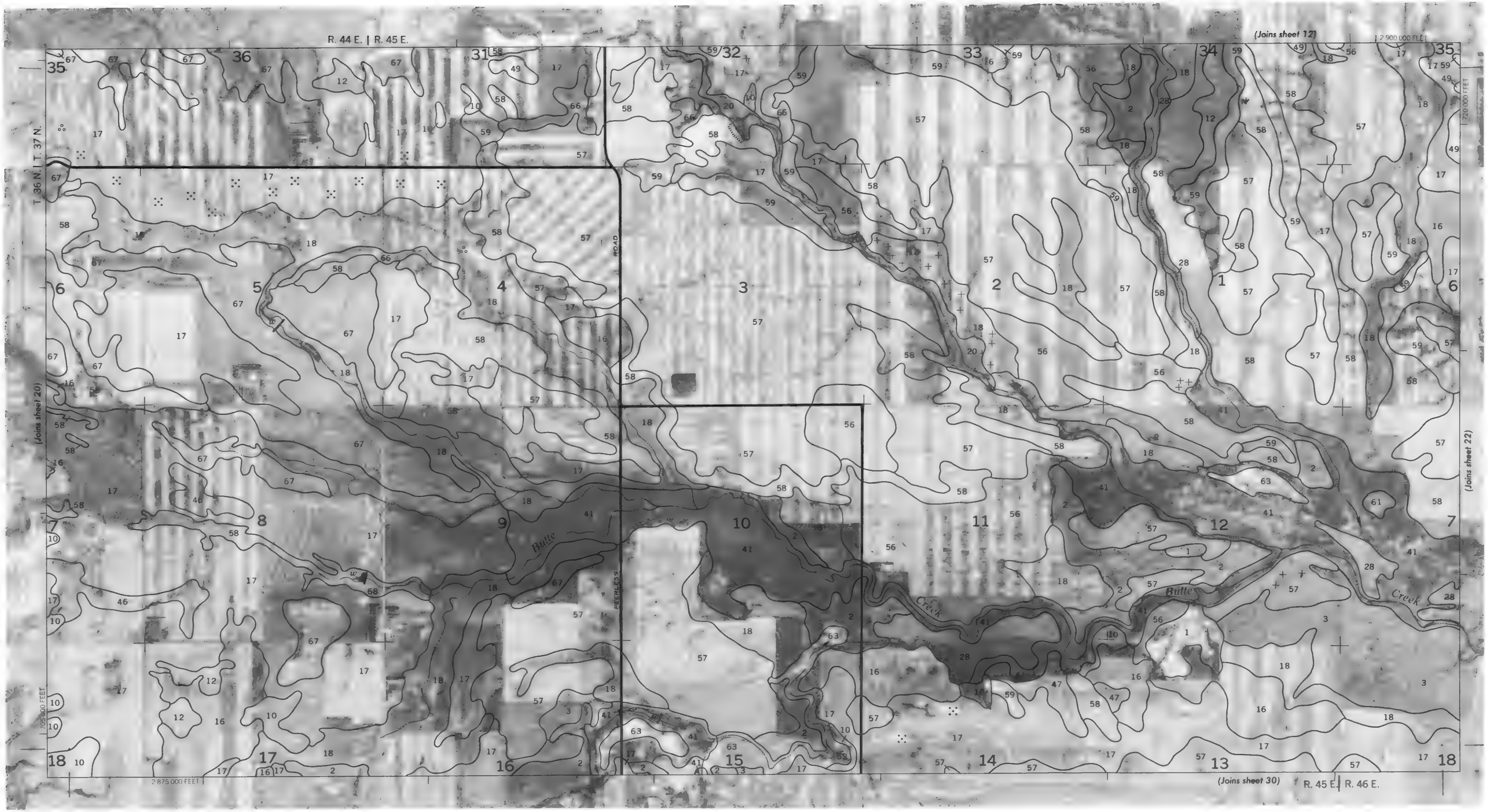
ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 20

21

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 21

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ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 22

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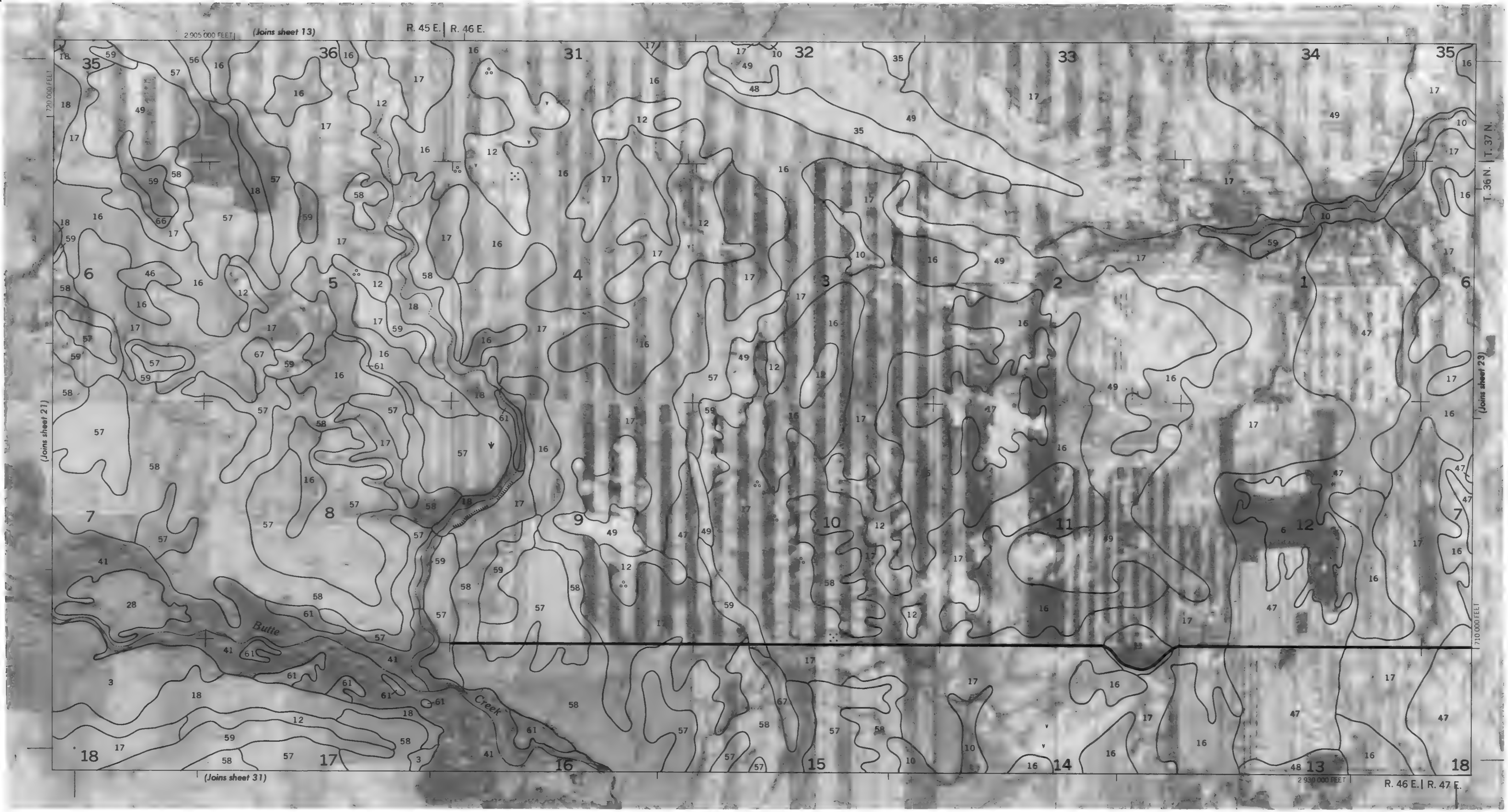

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned

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23

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 23

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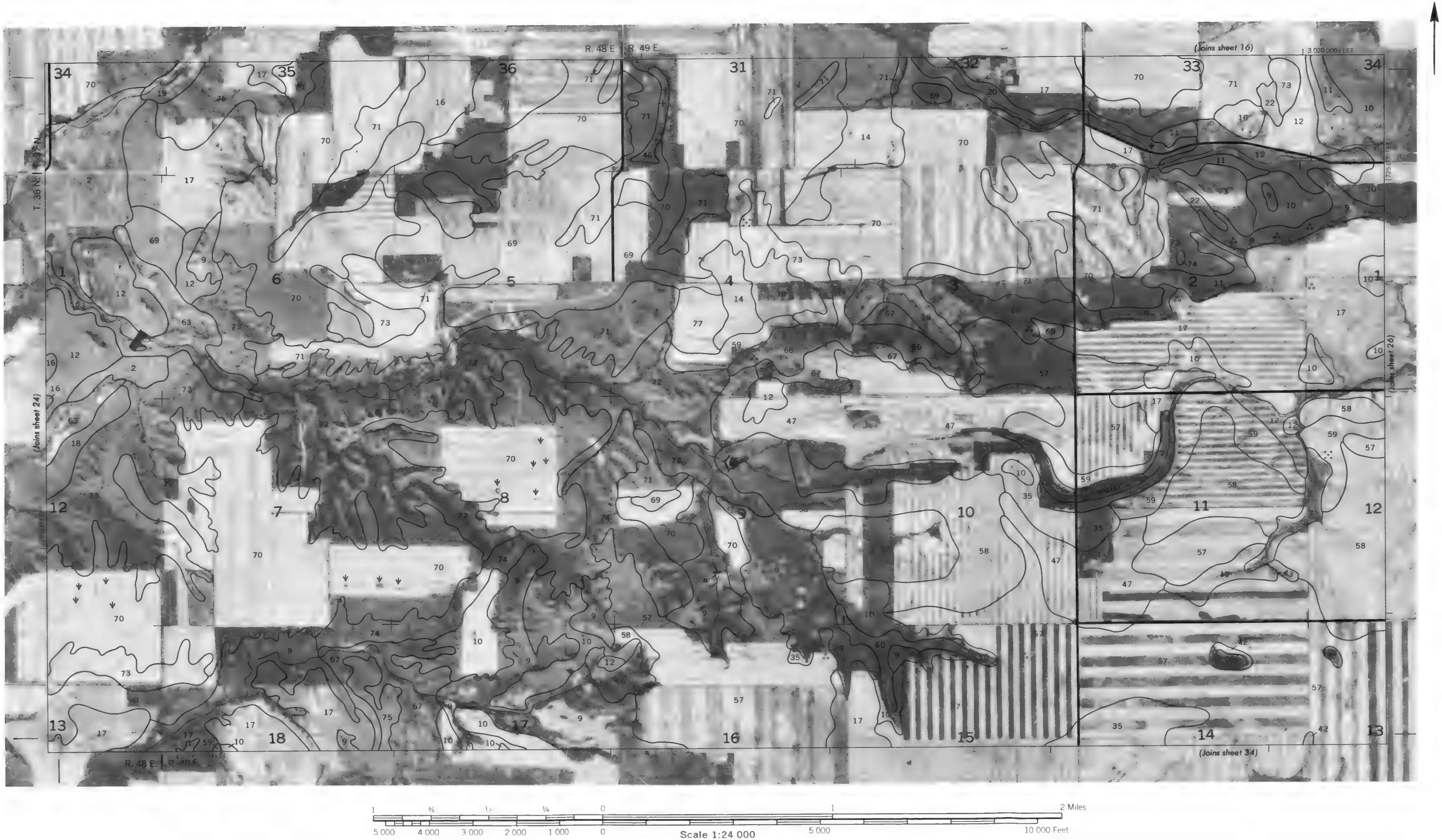
1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 24

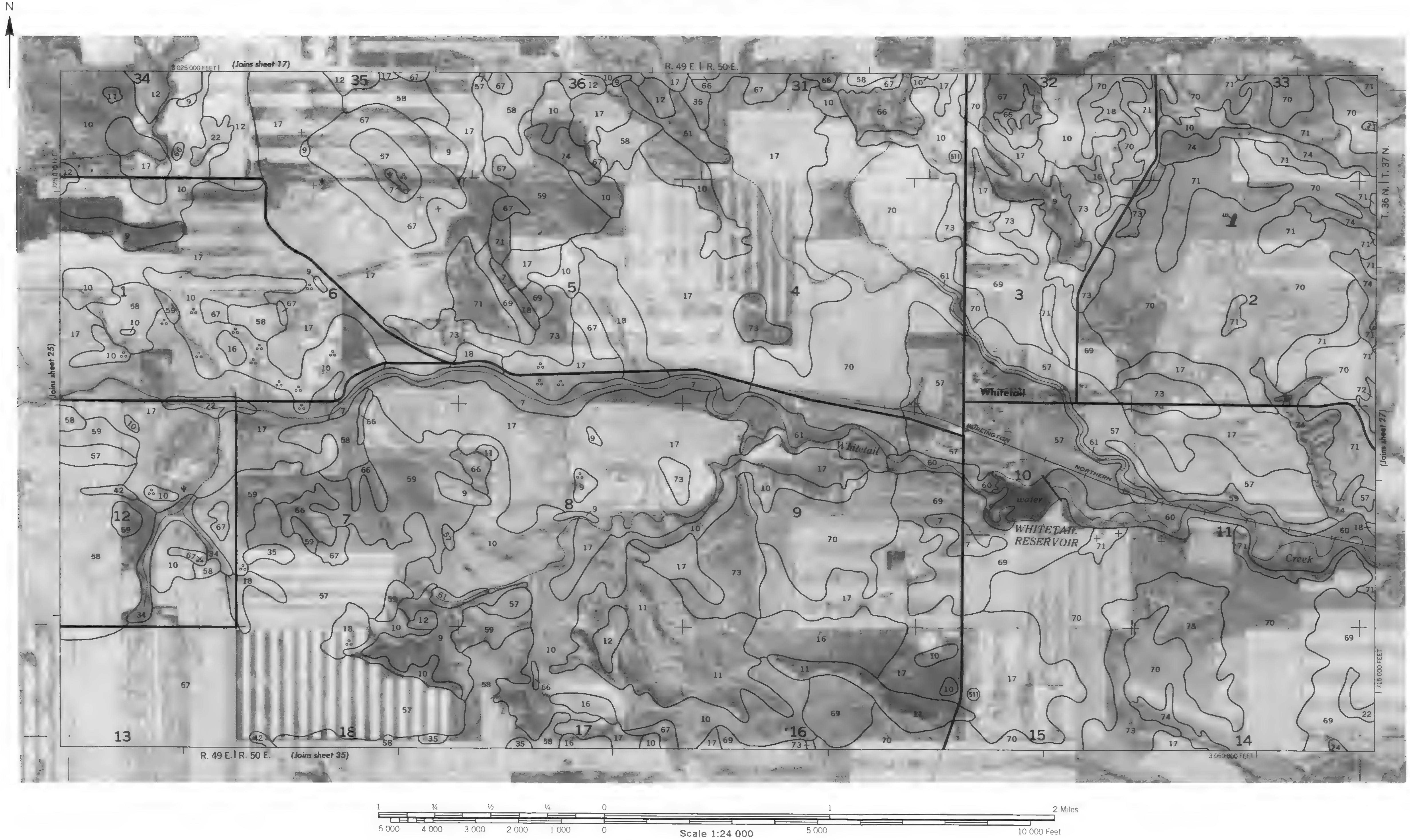
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.



ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 25

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 26

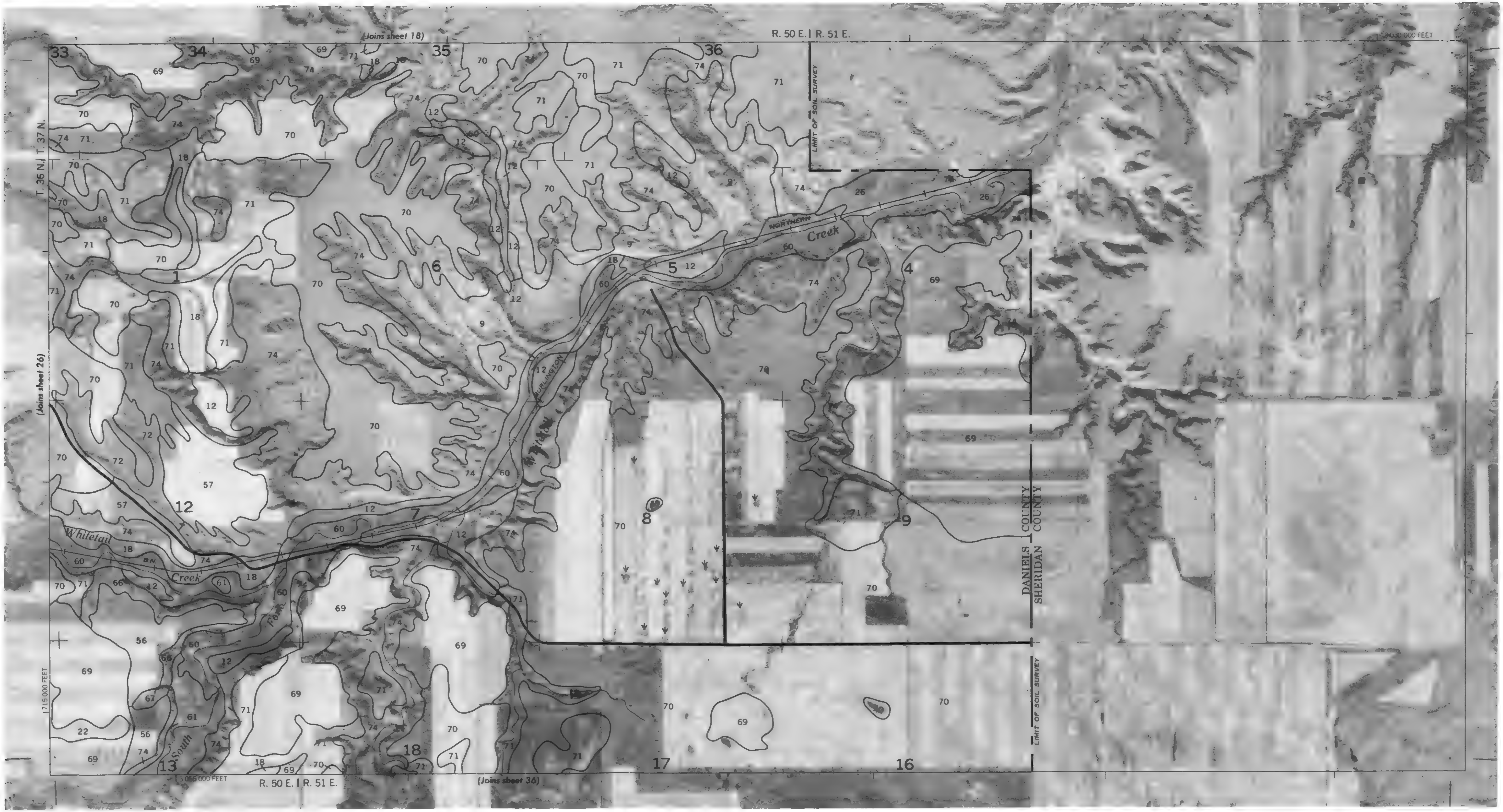


Coordinate grid ticks and land division corners, if shown, are approximately positioned

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

27

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

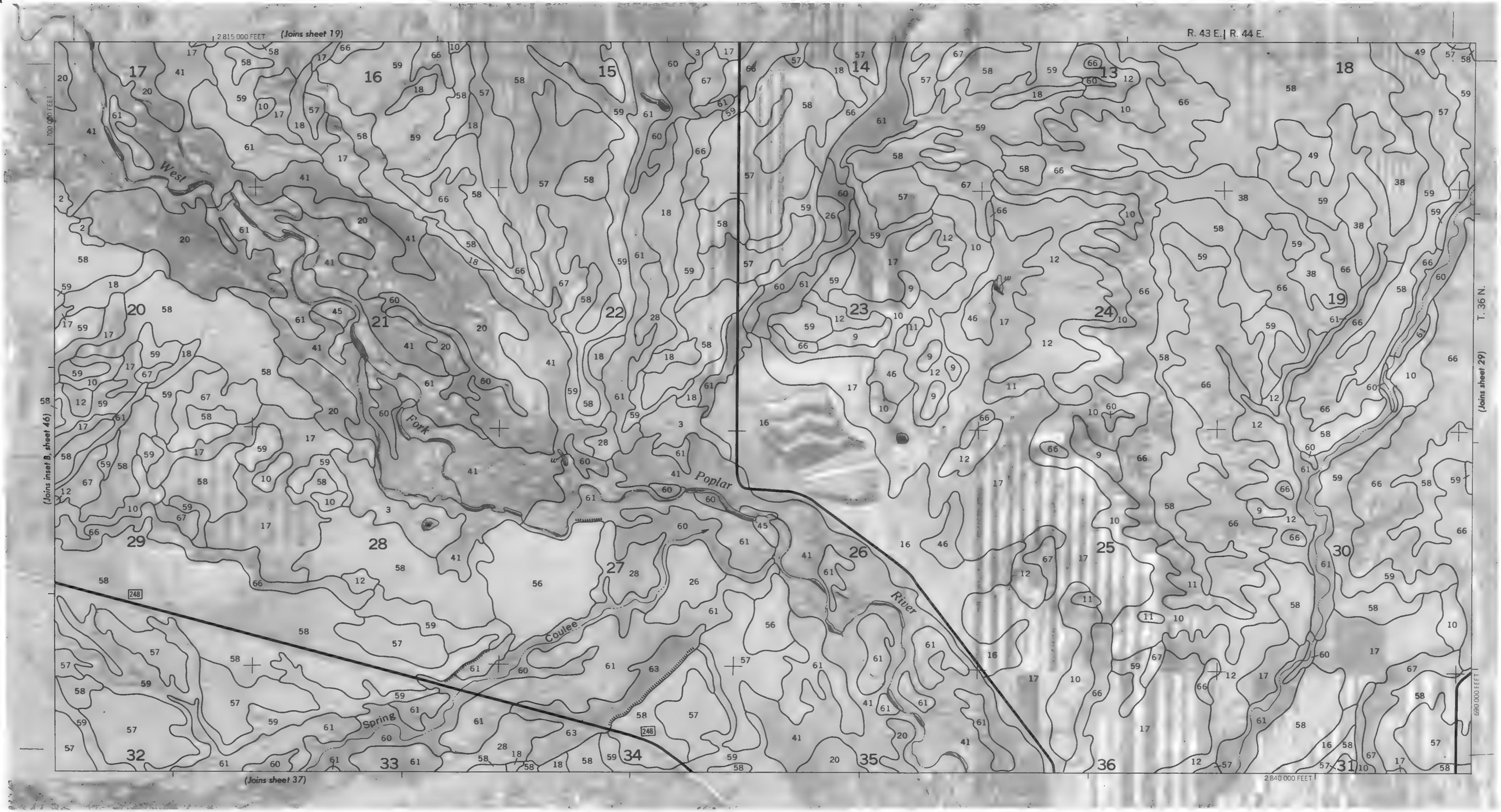
Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 27

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 28

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

29

N

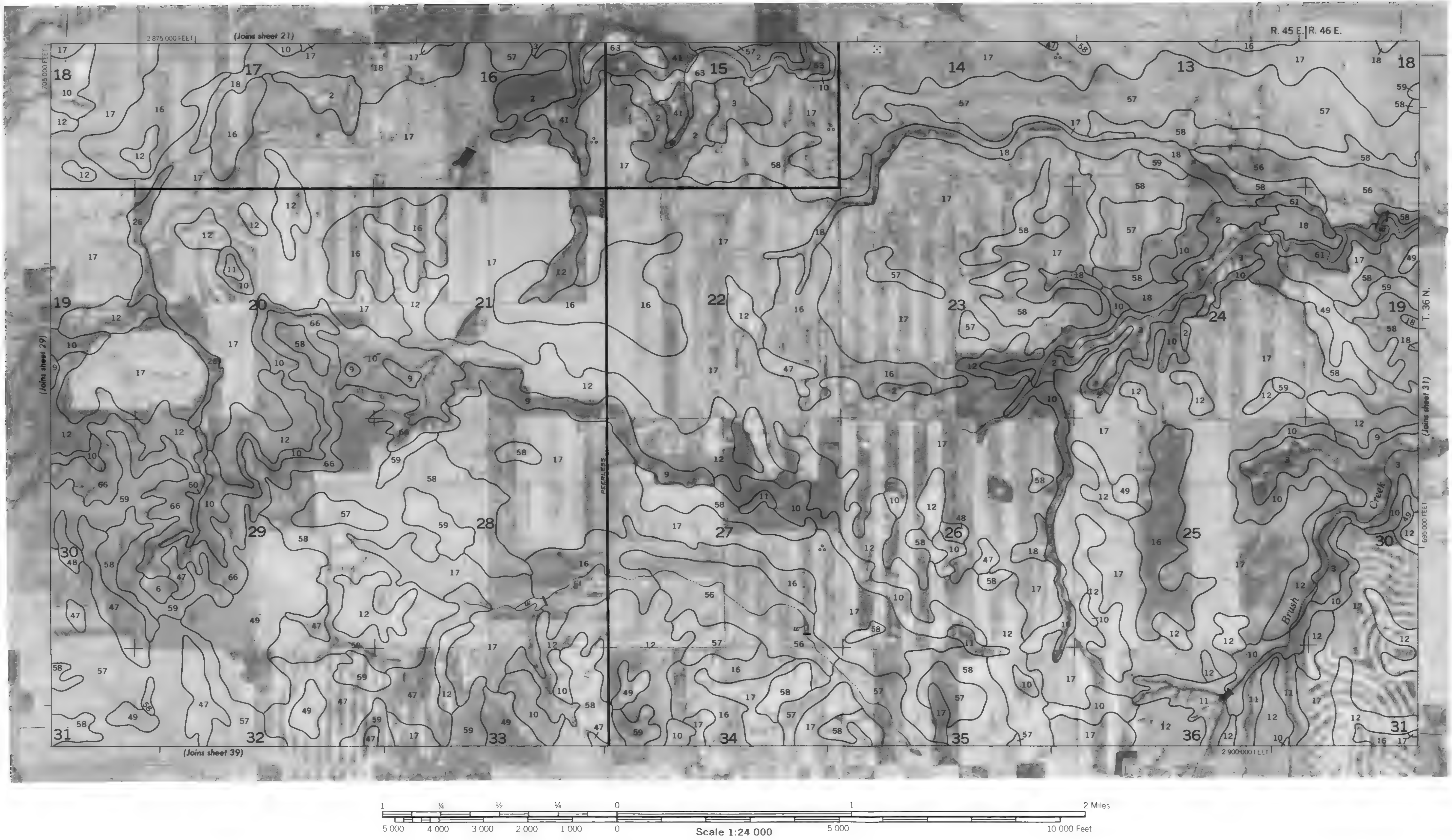
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N



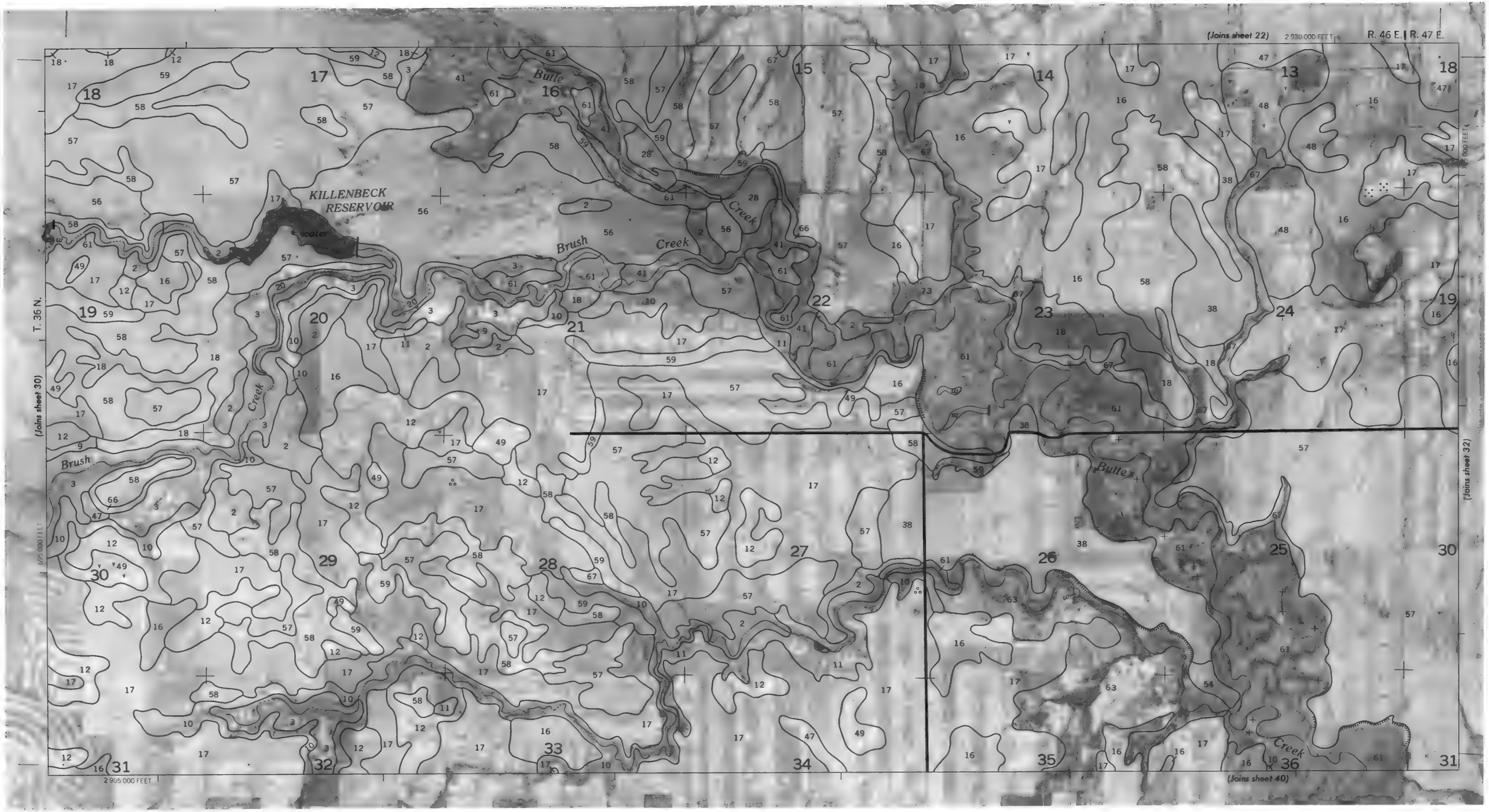
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

31

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 31

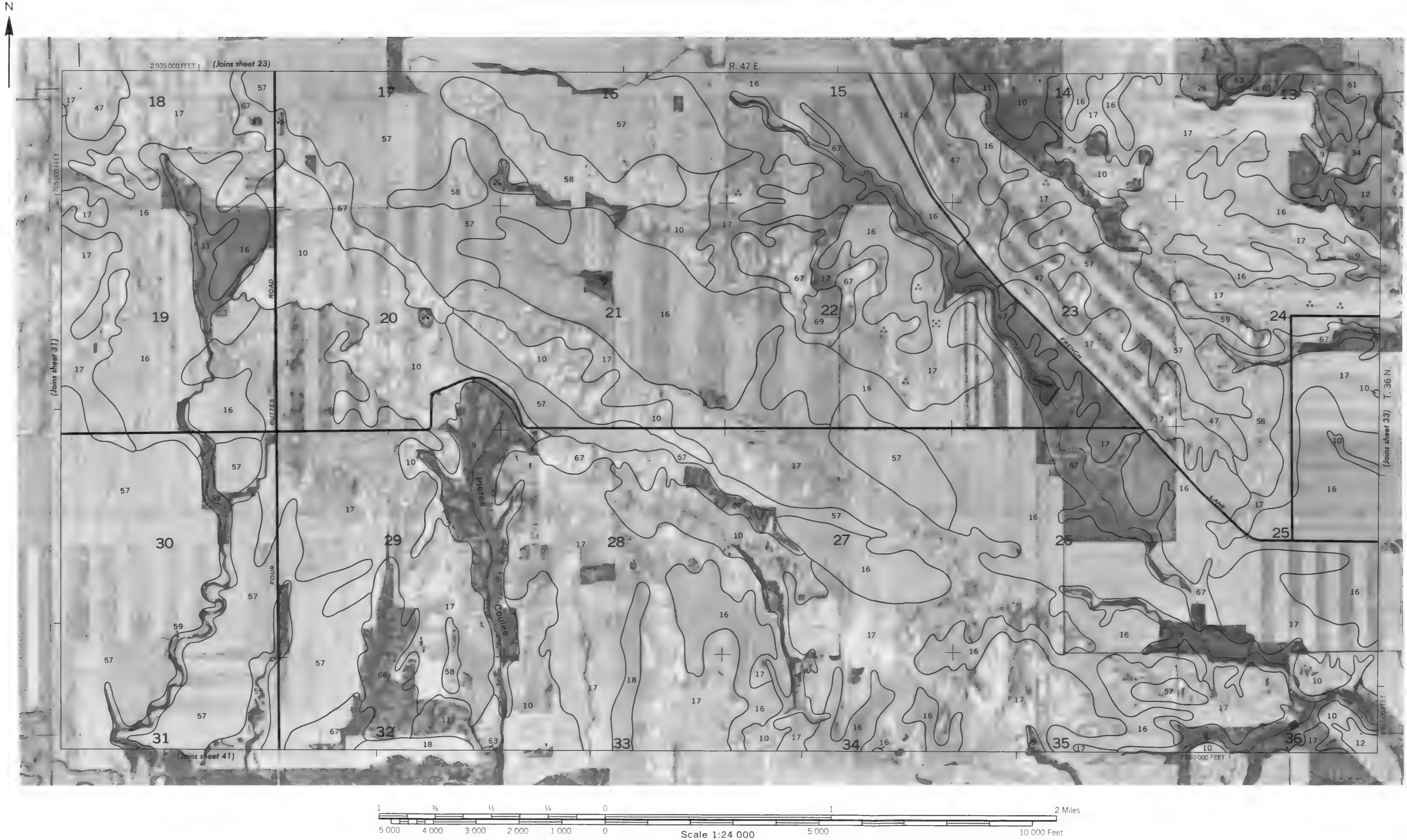
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

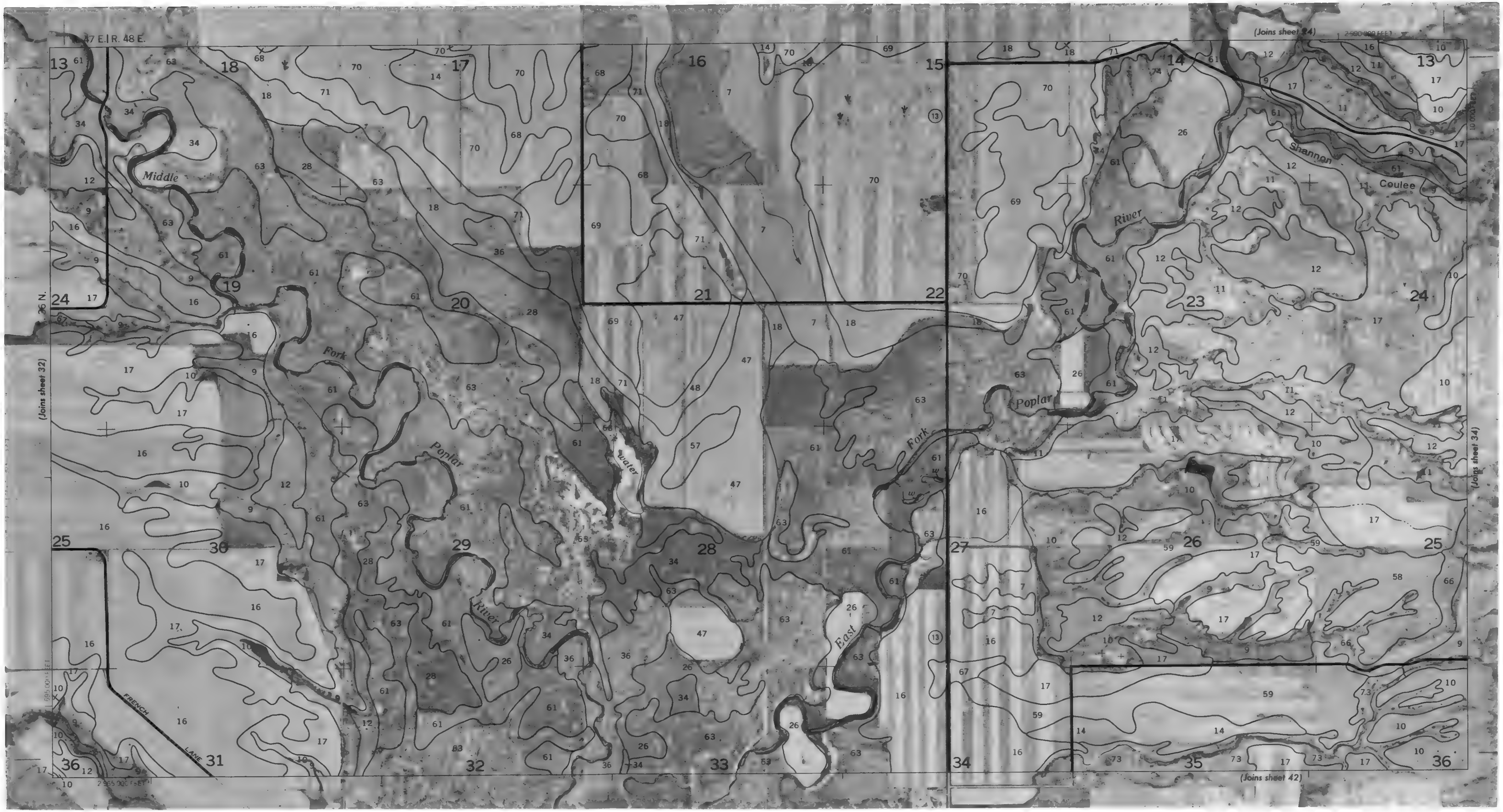
Scale 1:24 000



Coordinate grid ticks and land division corners, if shown, are approximately positioned

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

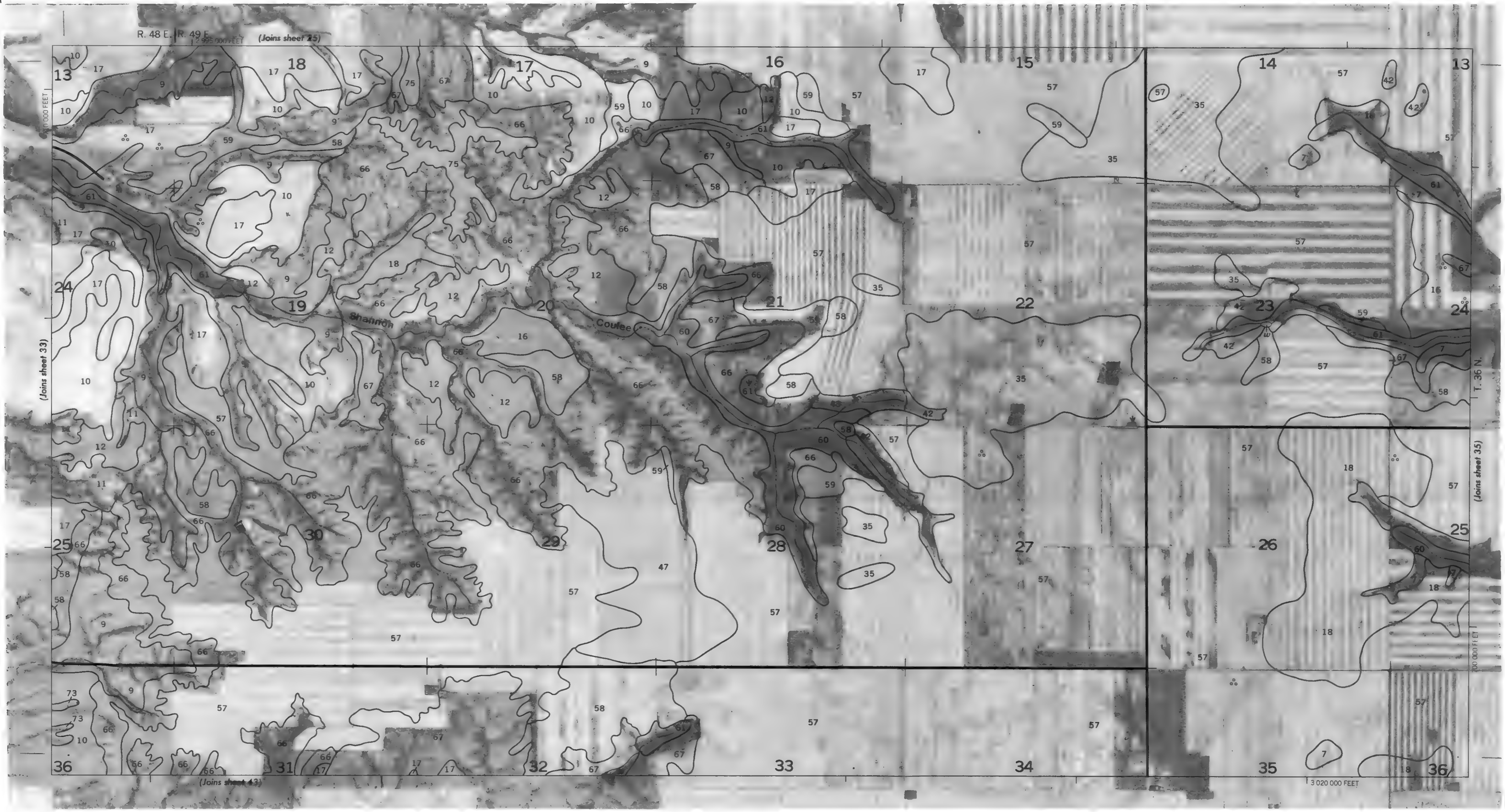
Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 33

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 34

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

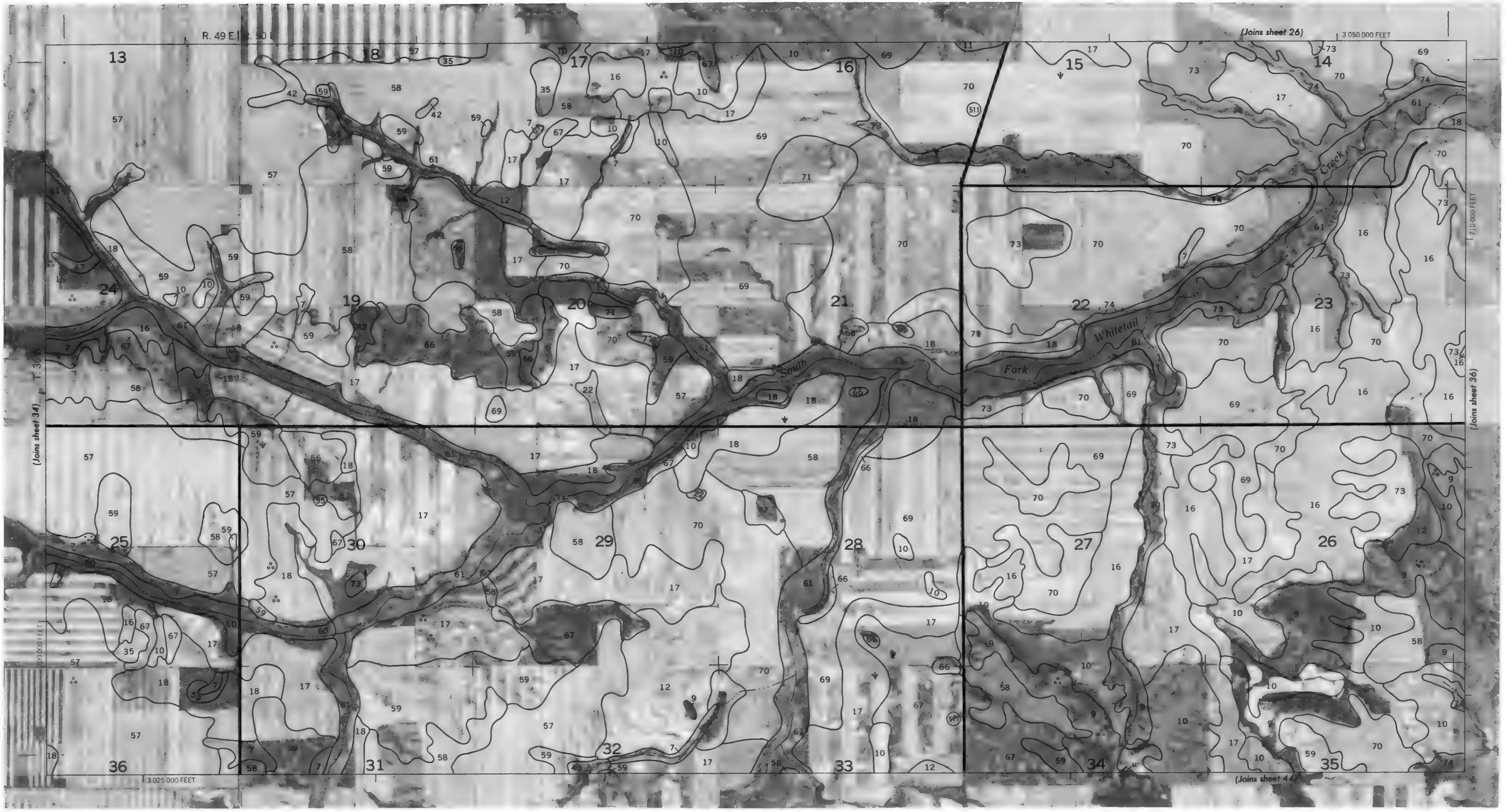
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

35

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 35

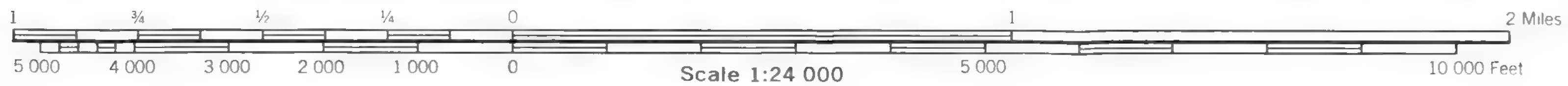
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000



Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

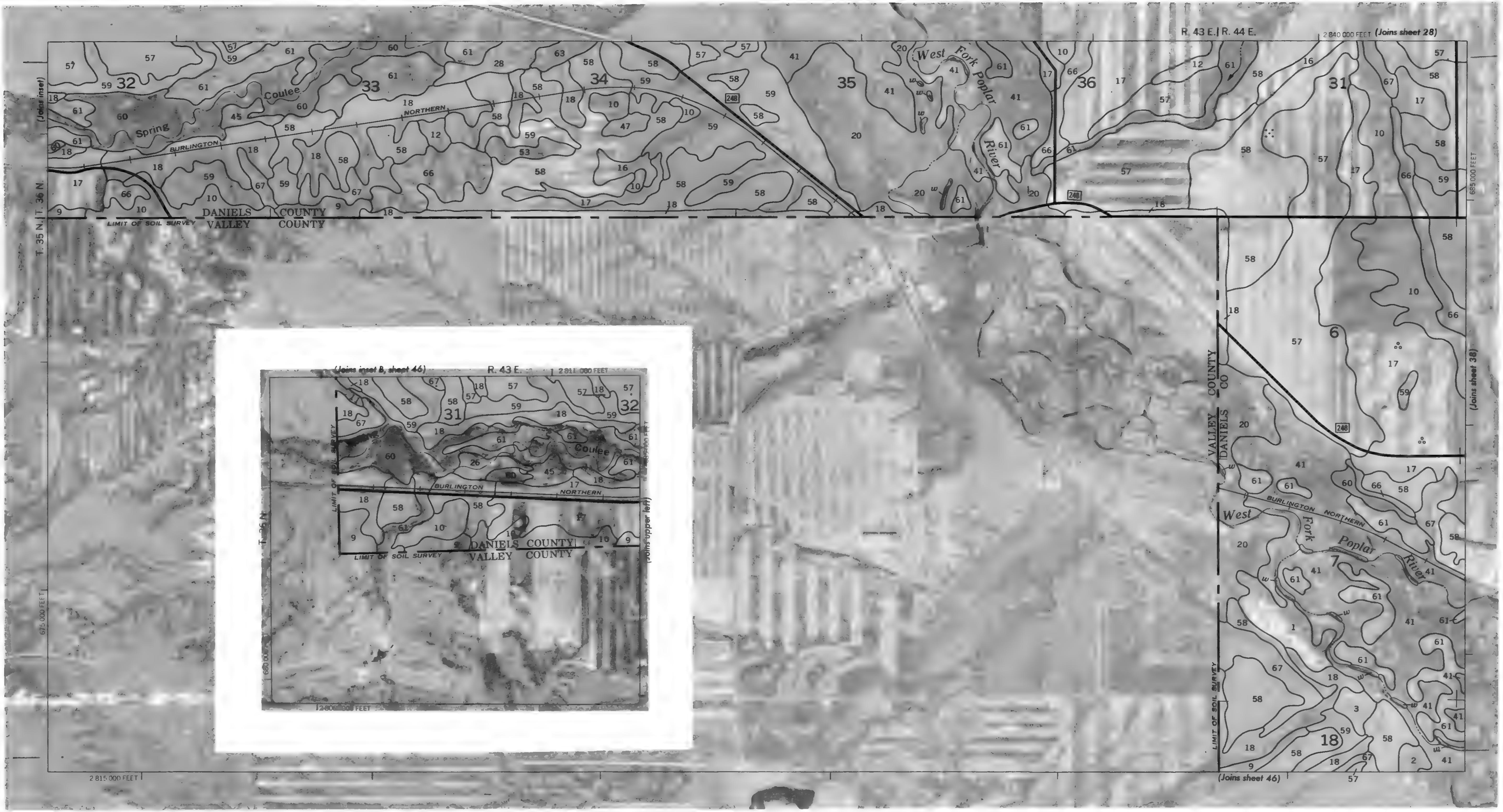
ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 36

37

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 37

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

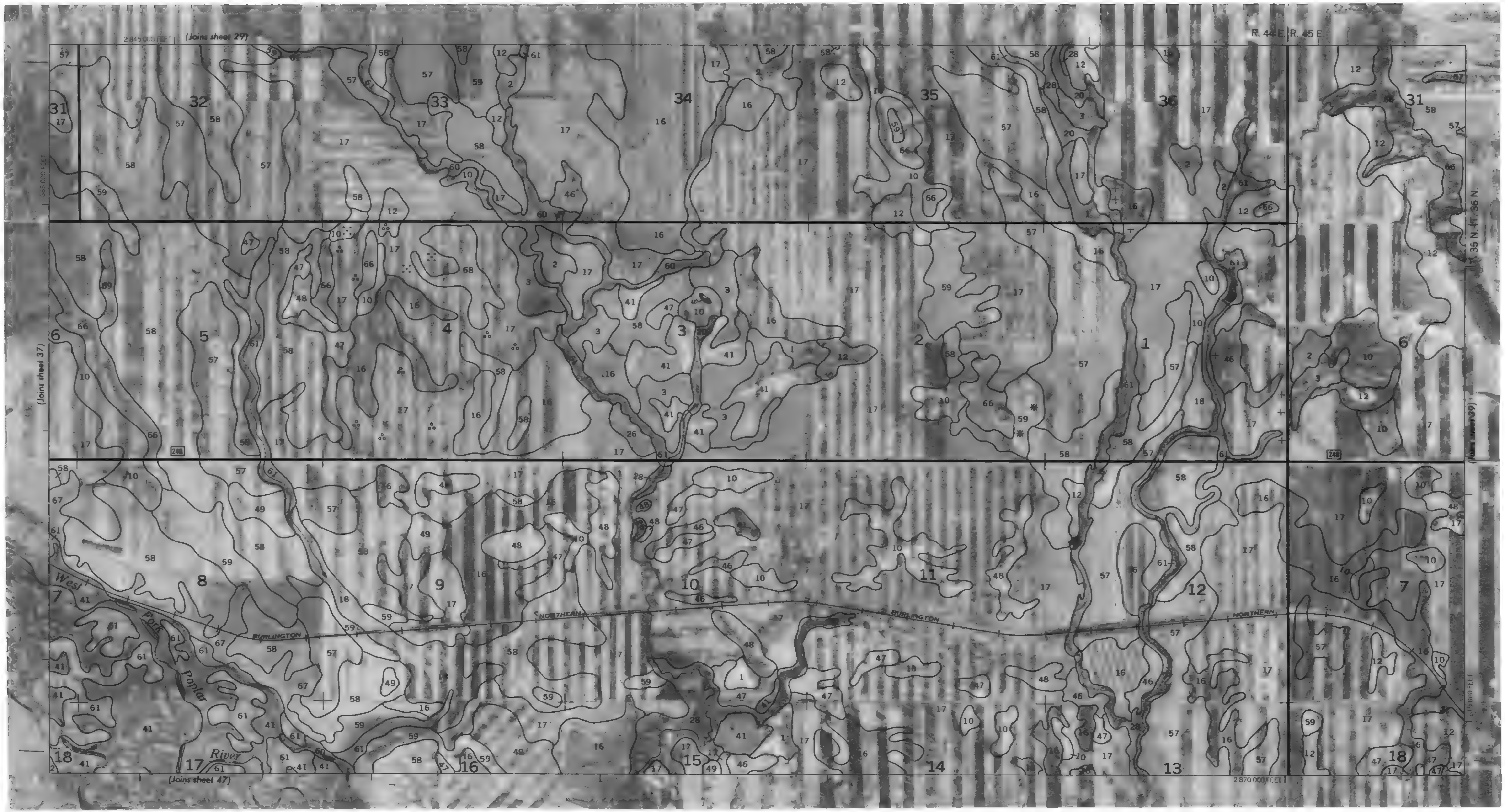


1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N



Scale 1:24 000

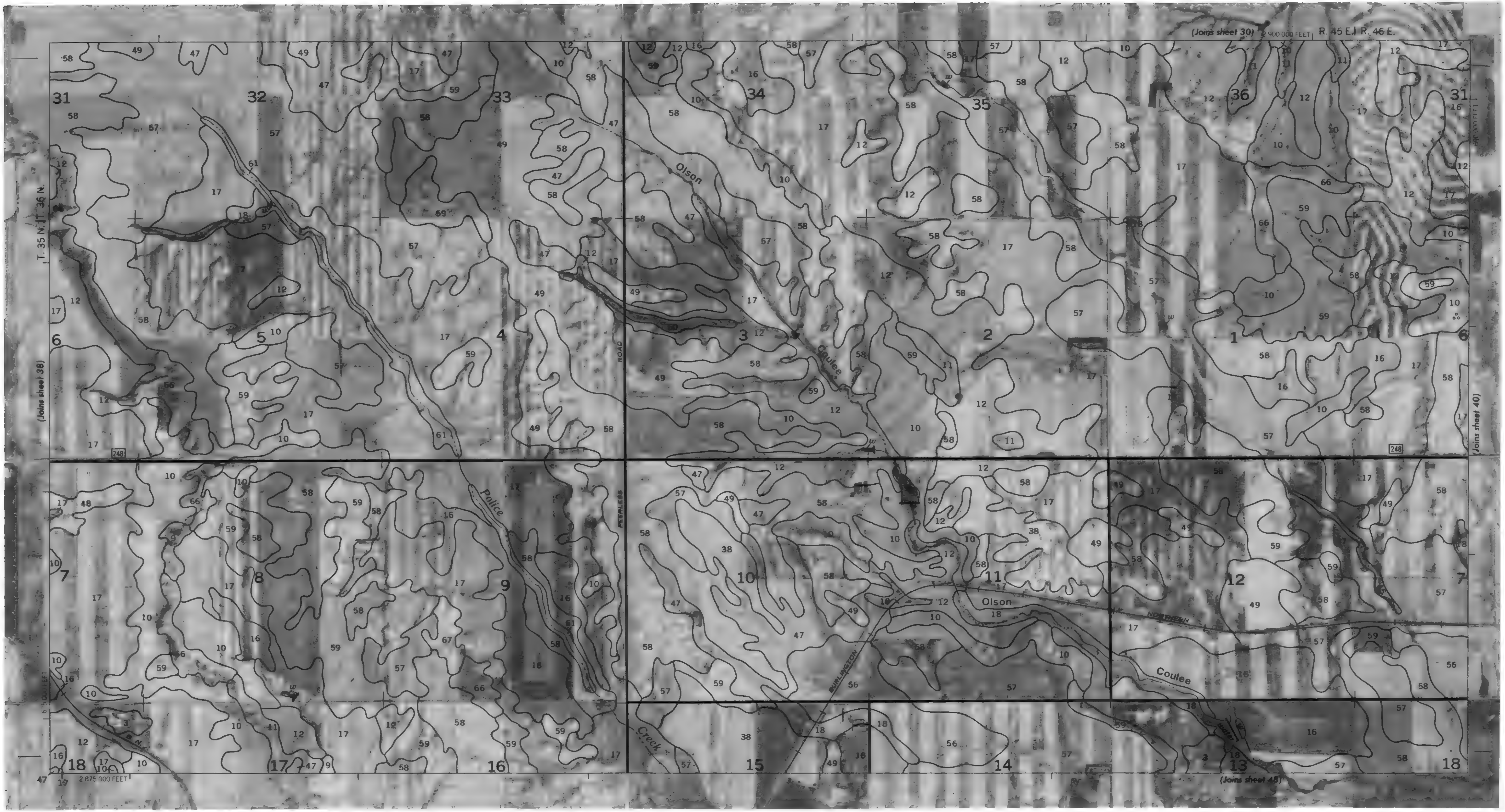
1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

39

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 39

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 40

Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 40

41

N

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 41

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 42

N

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned

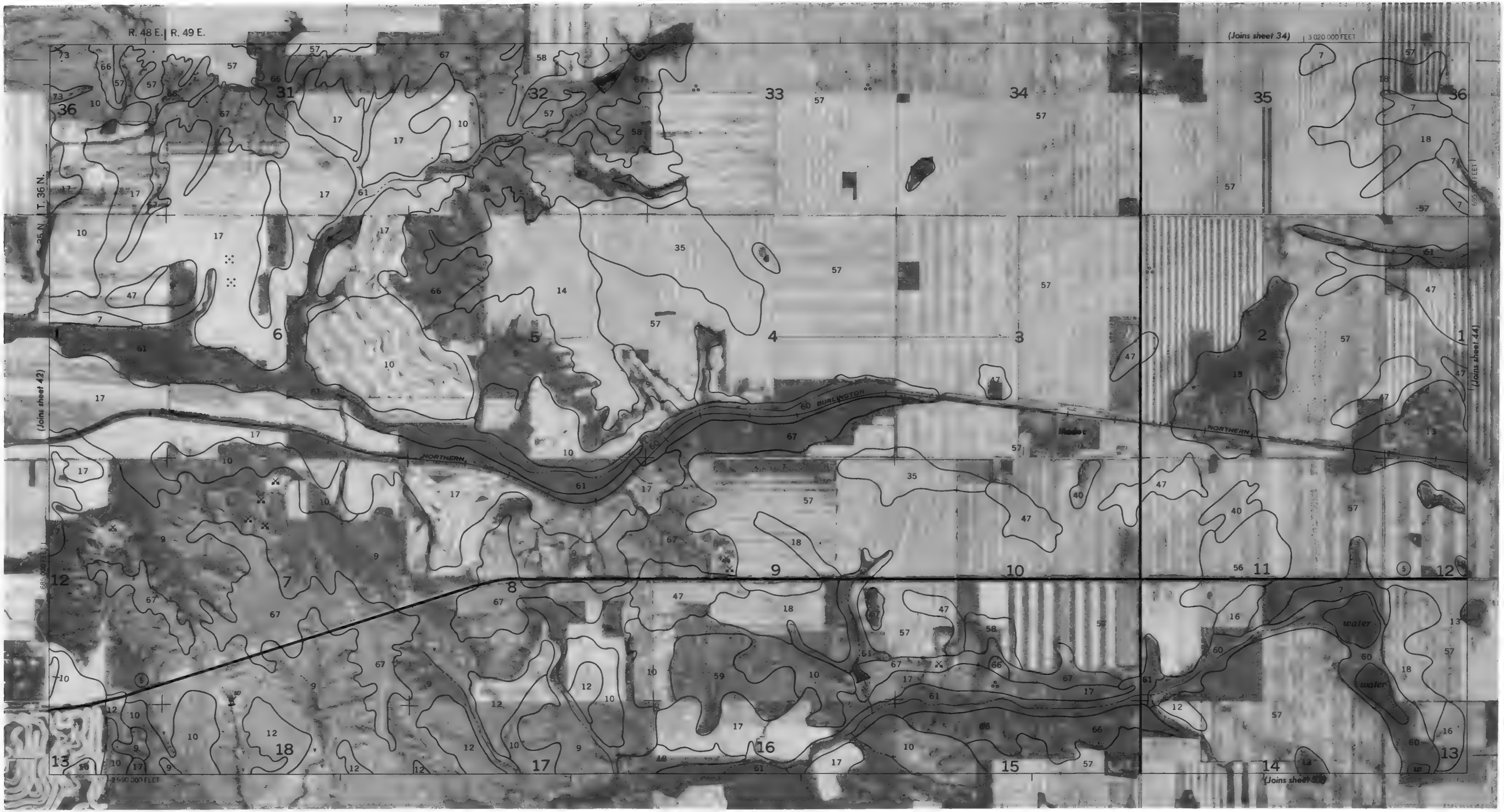
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 42

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 43

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

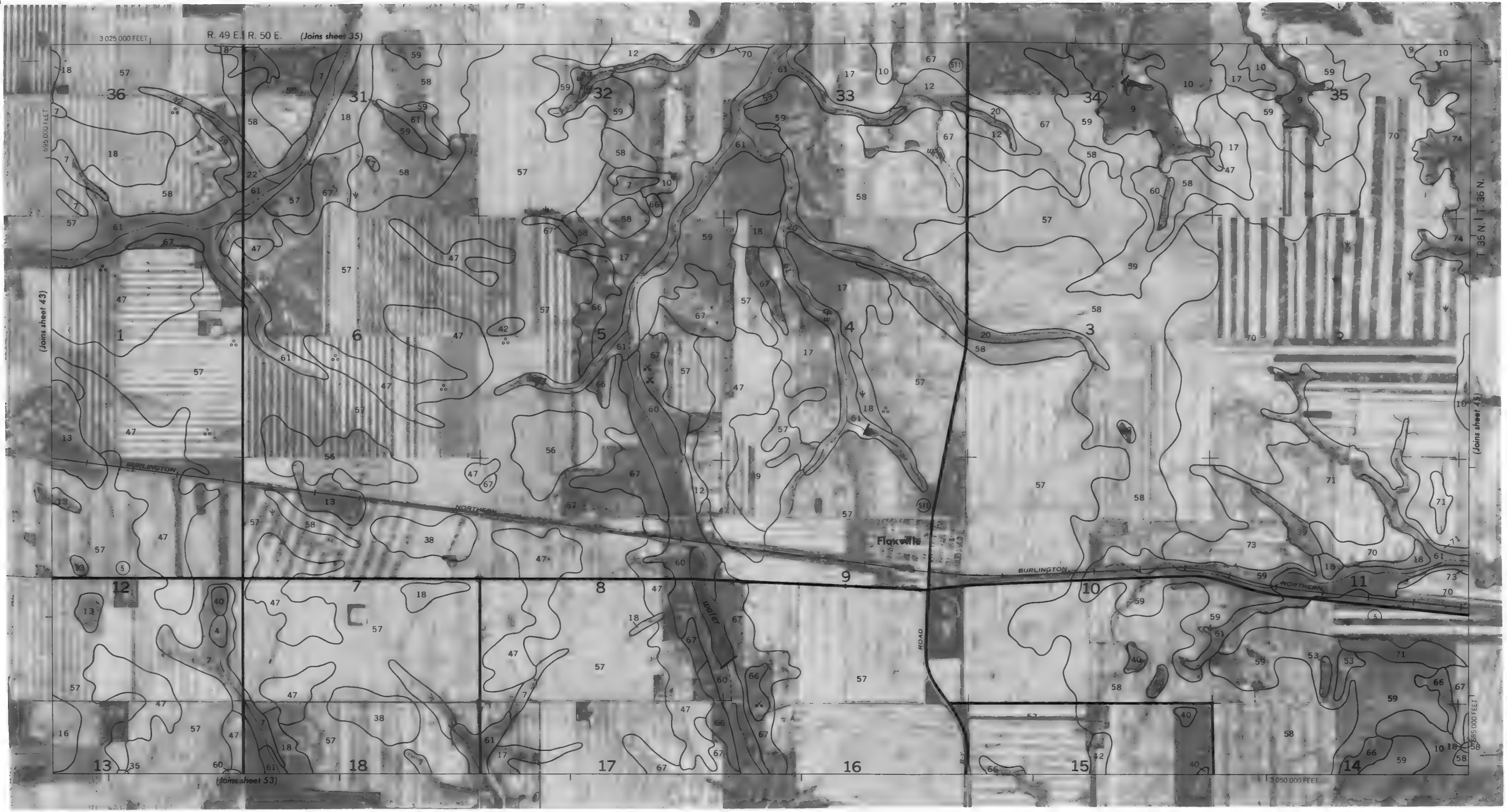


1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N



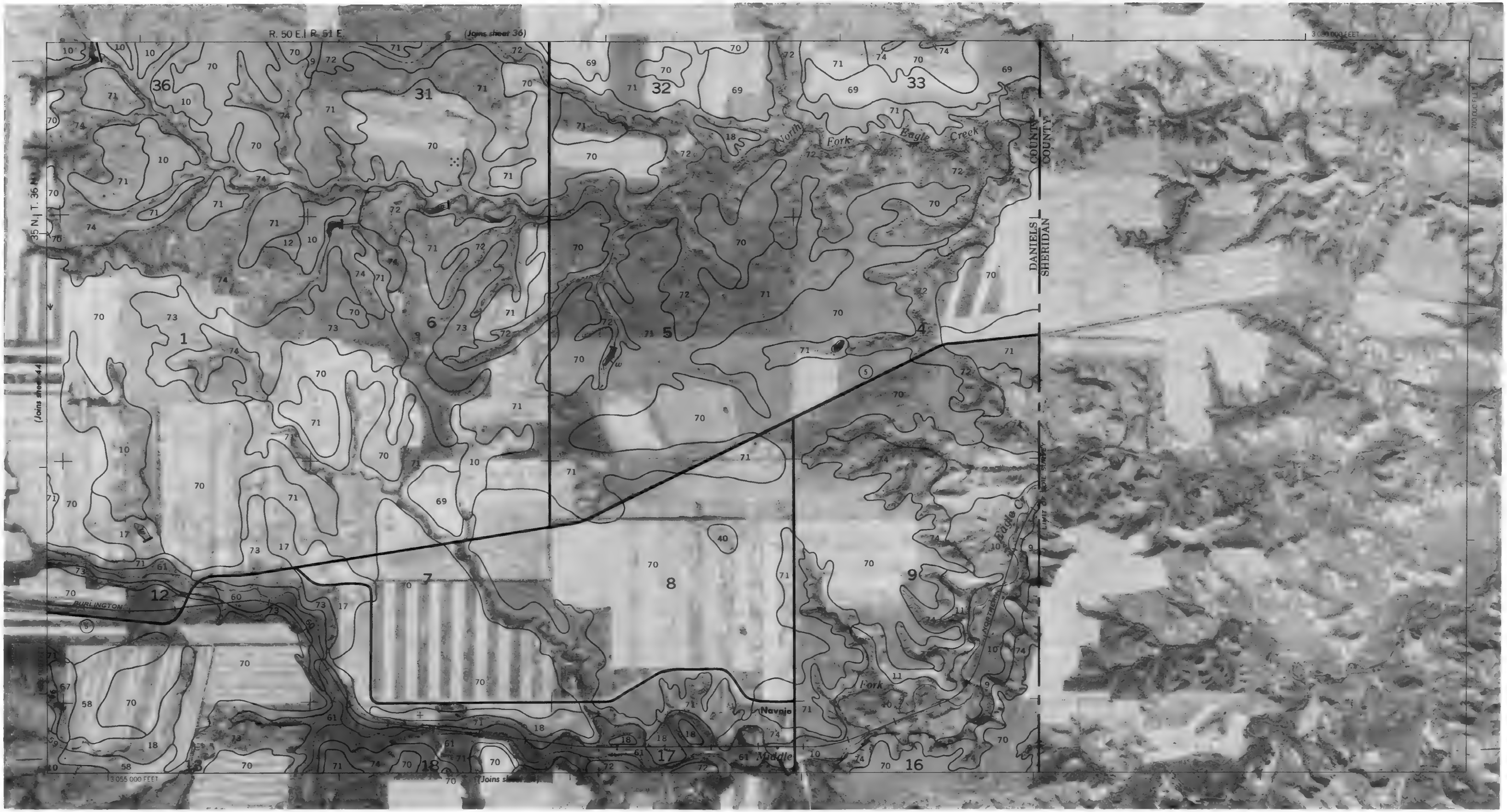
1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

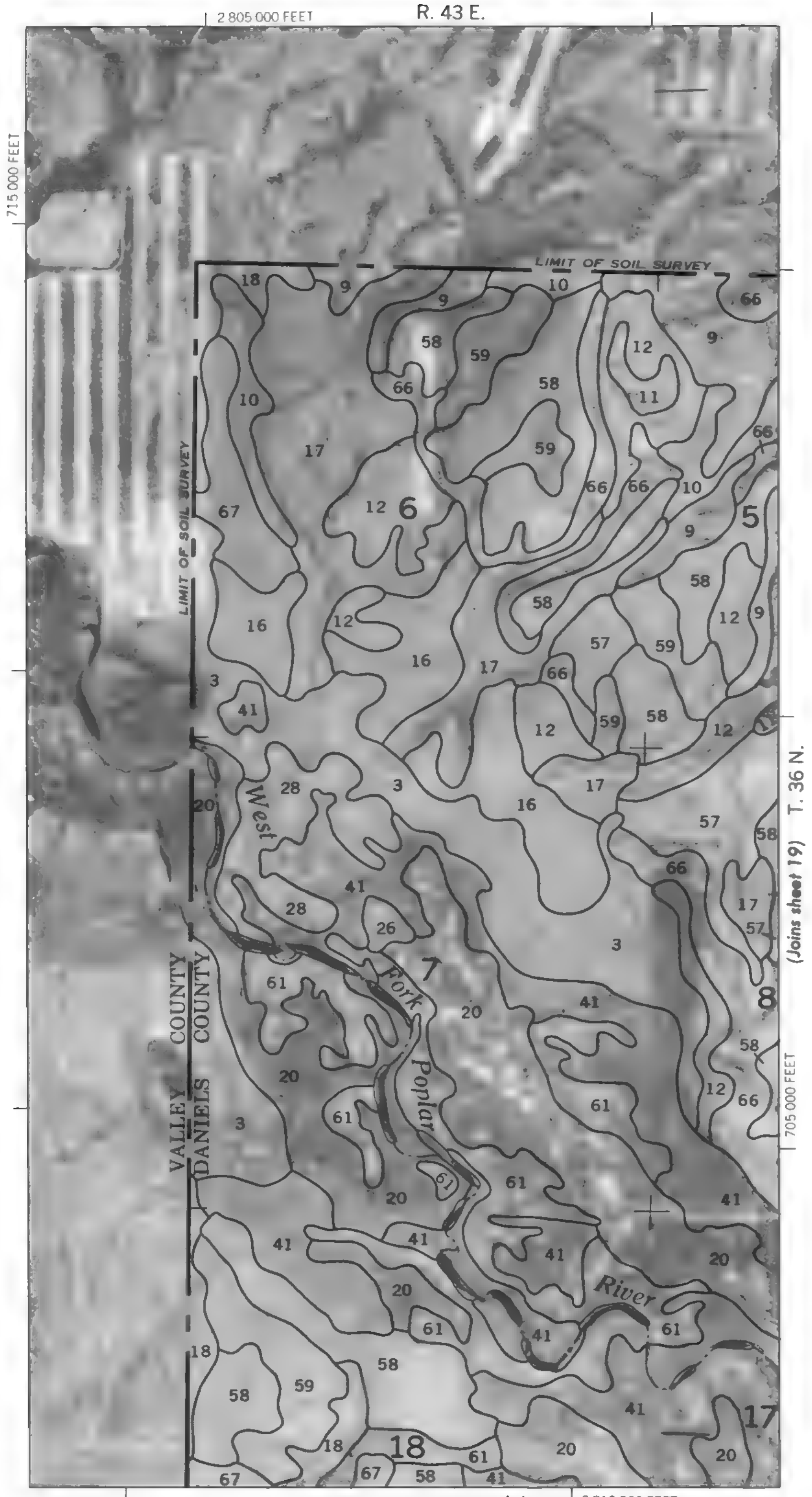
Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 45

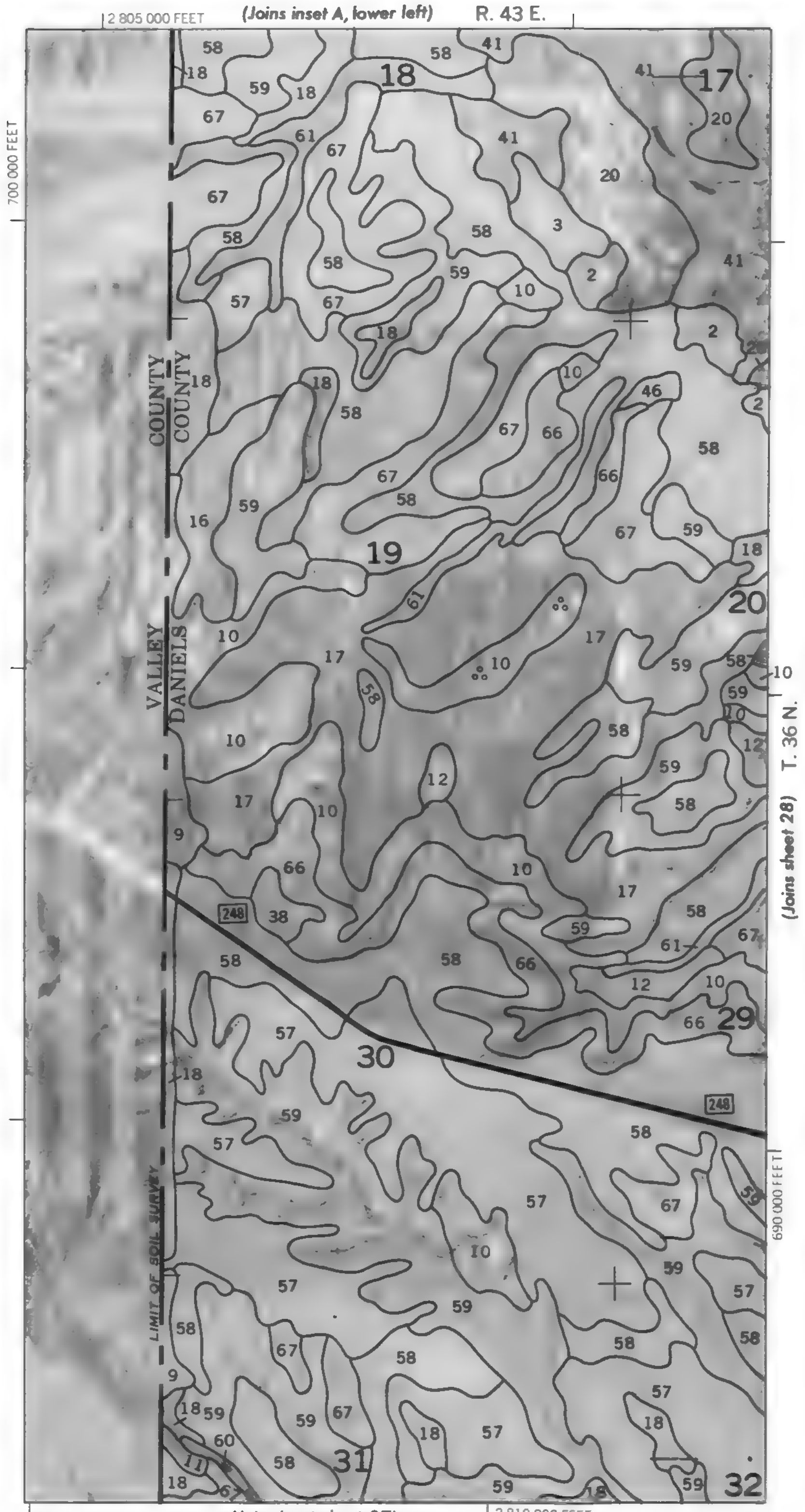
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

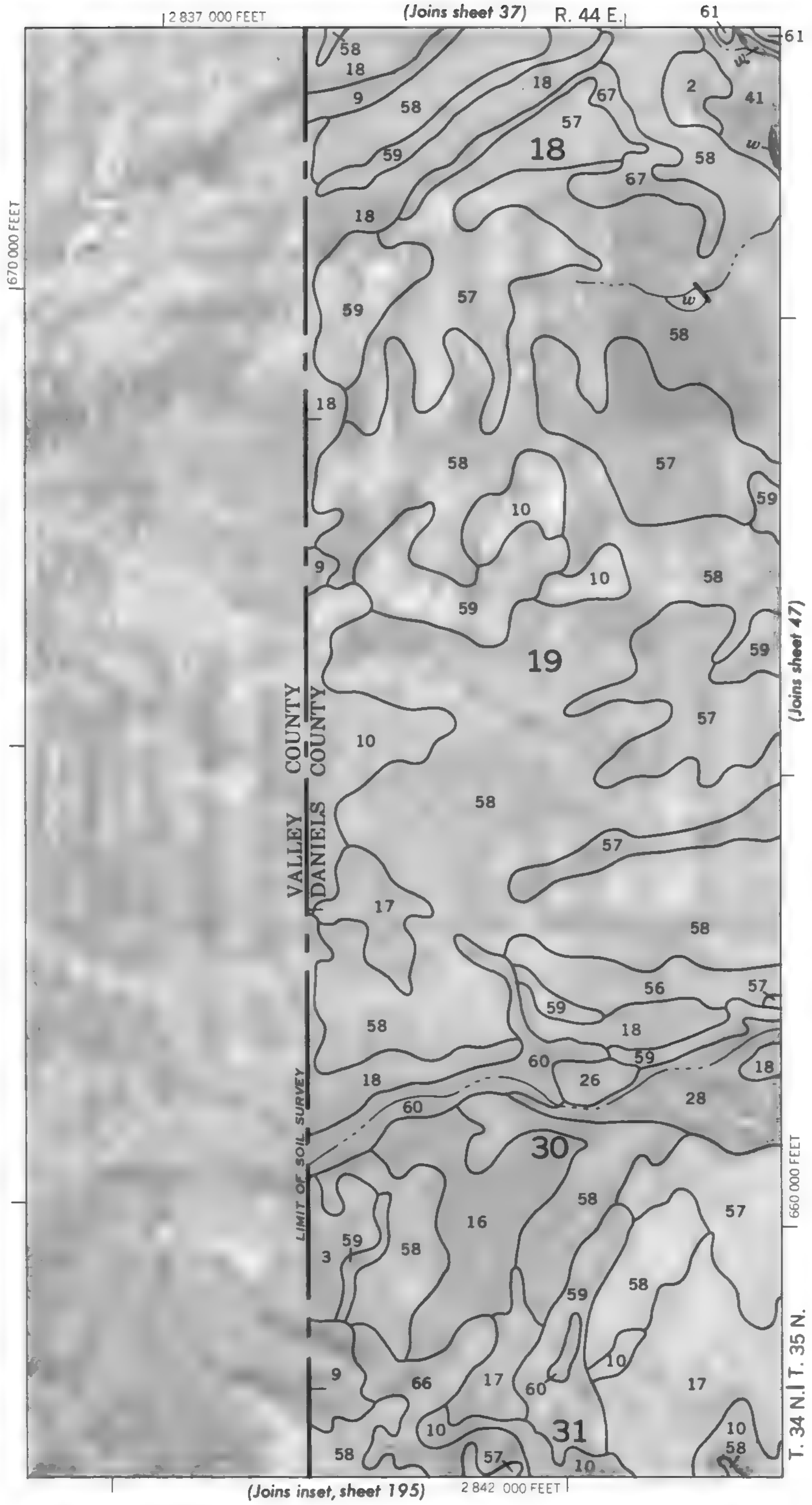
ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 46



INSET A



INSET B



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

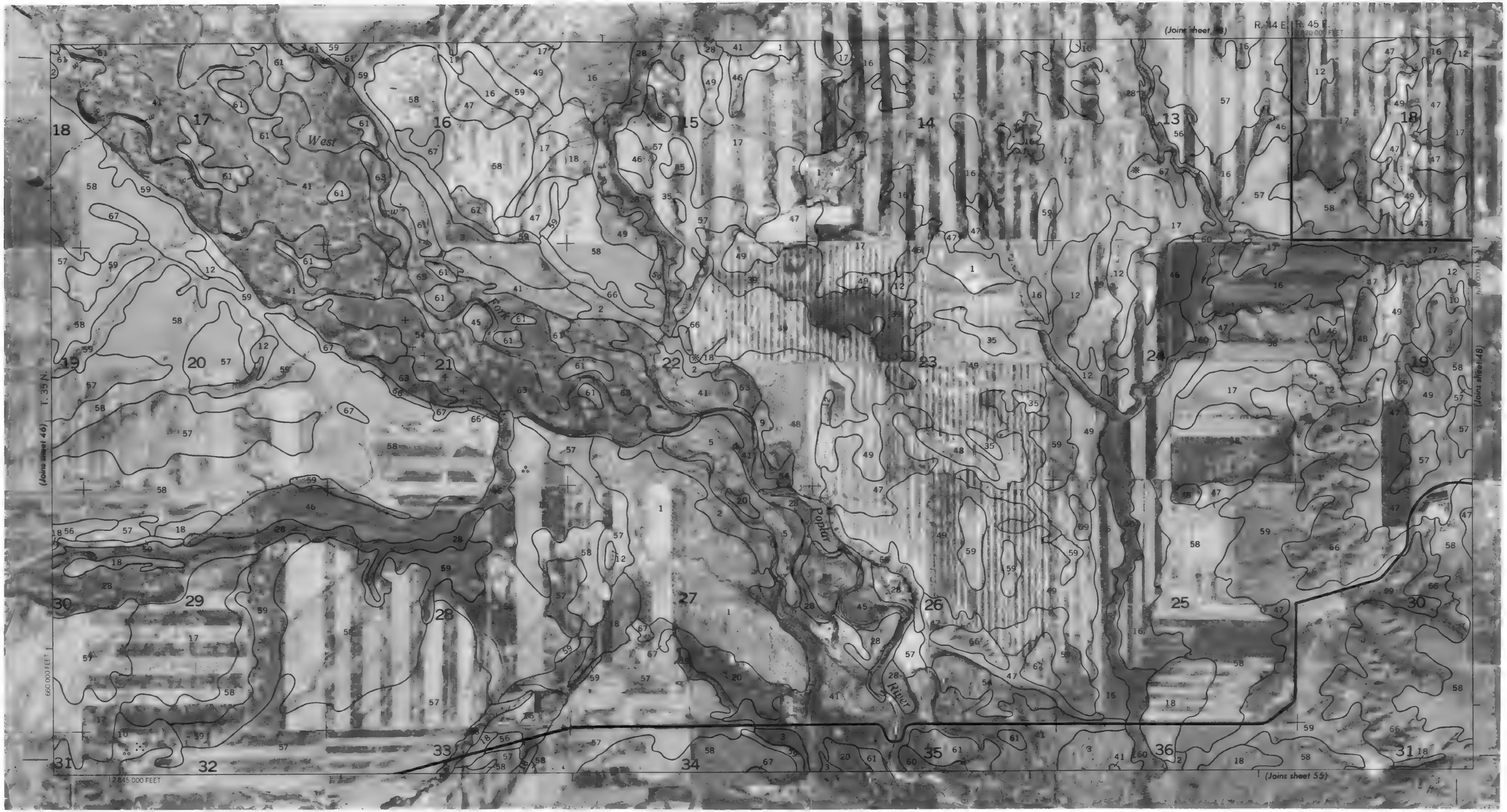
ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 46

47

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 47

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



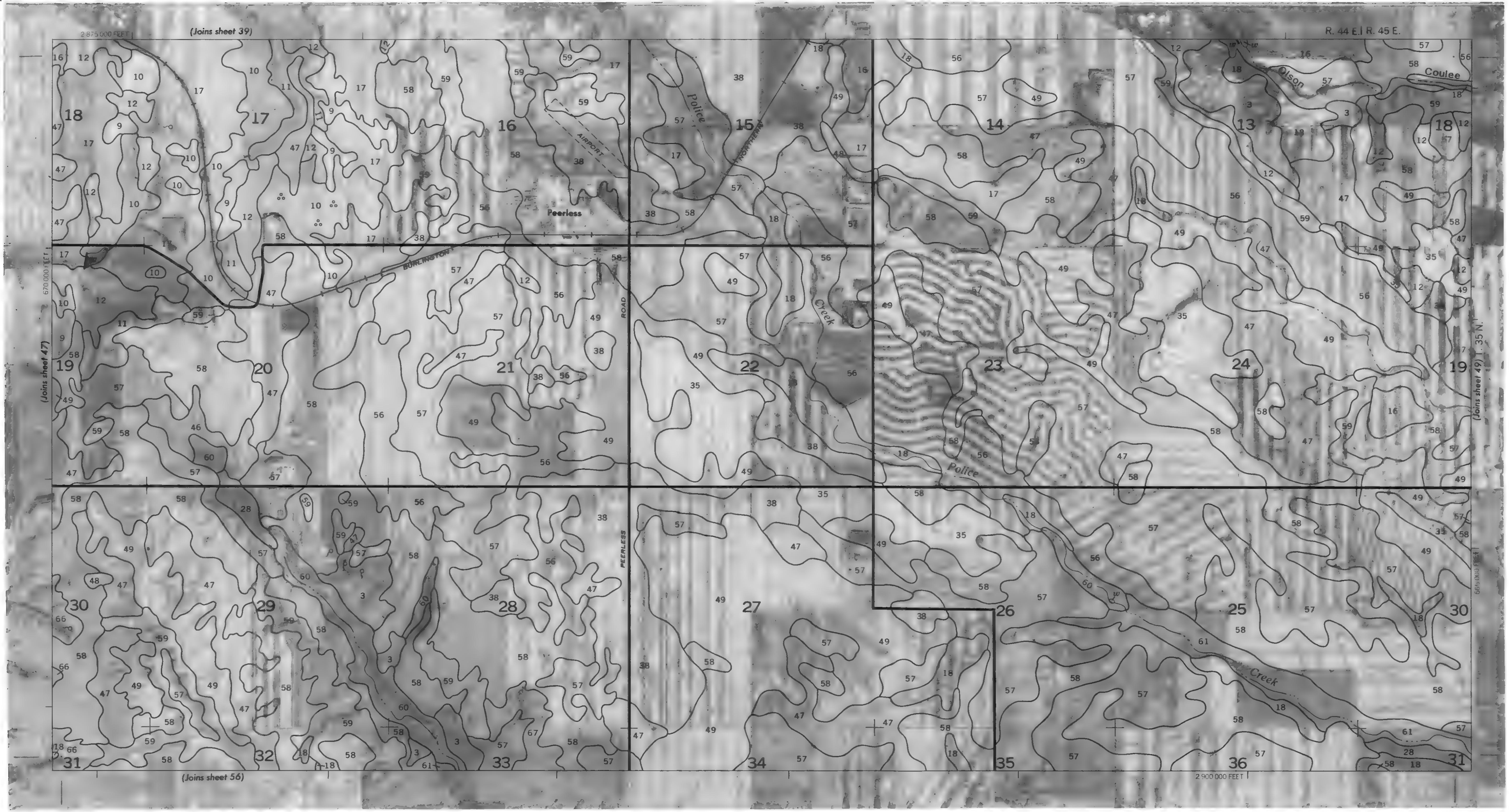
1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 48

N



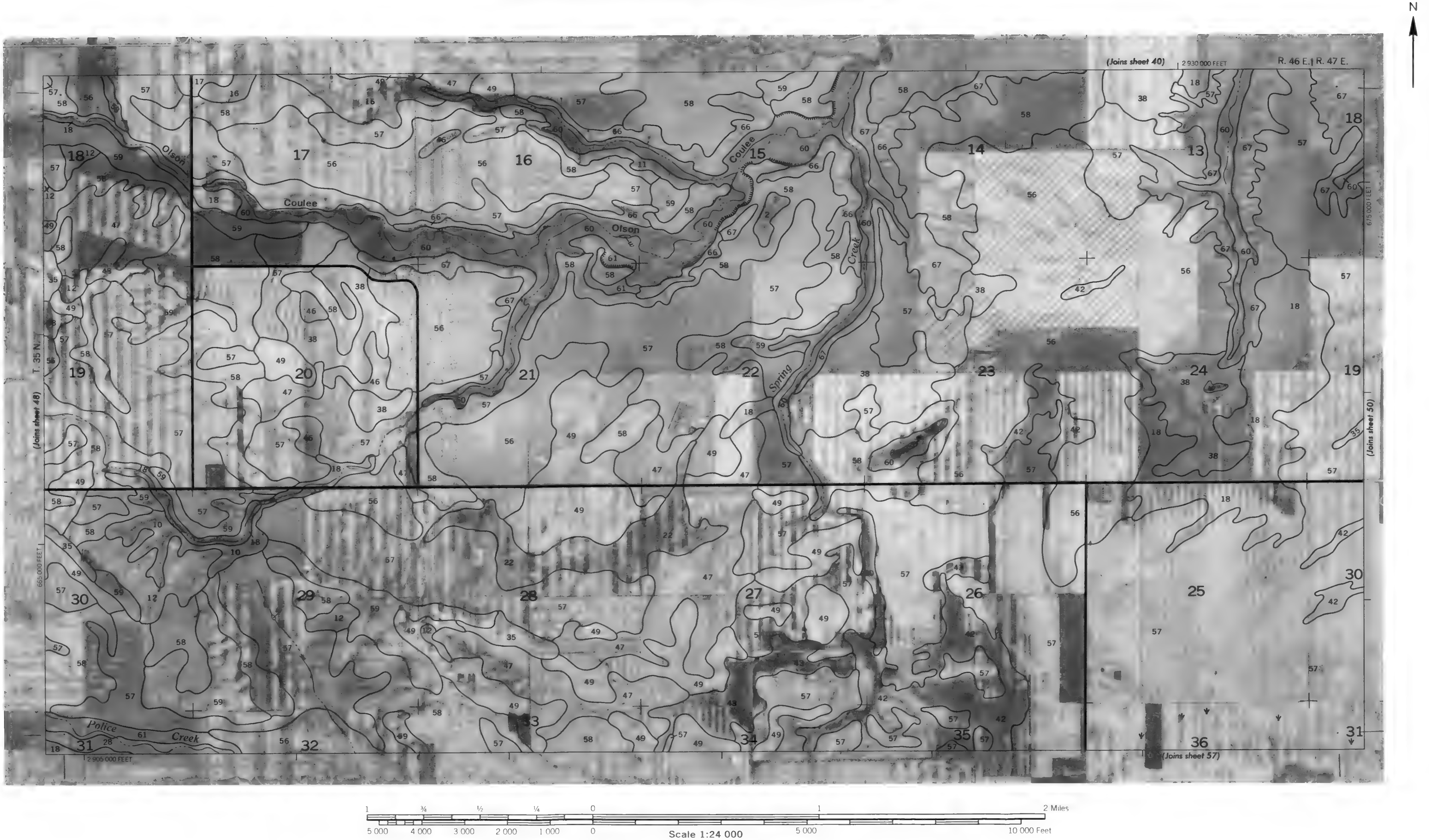
Scale 1:24 000

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

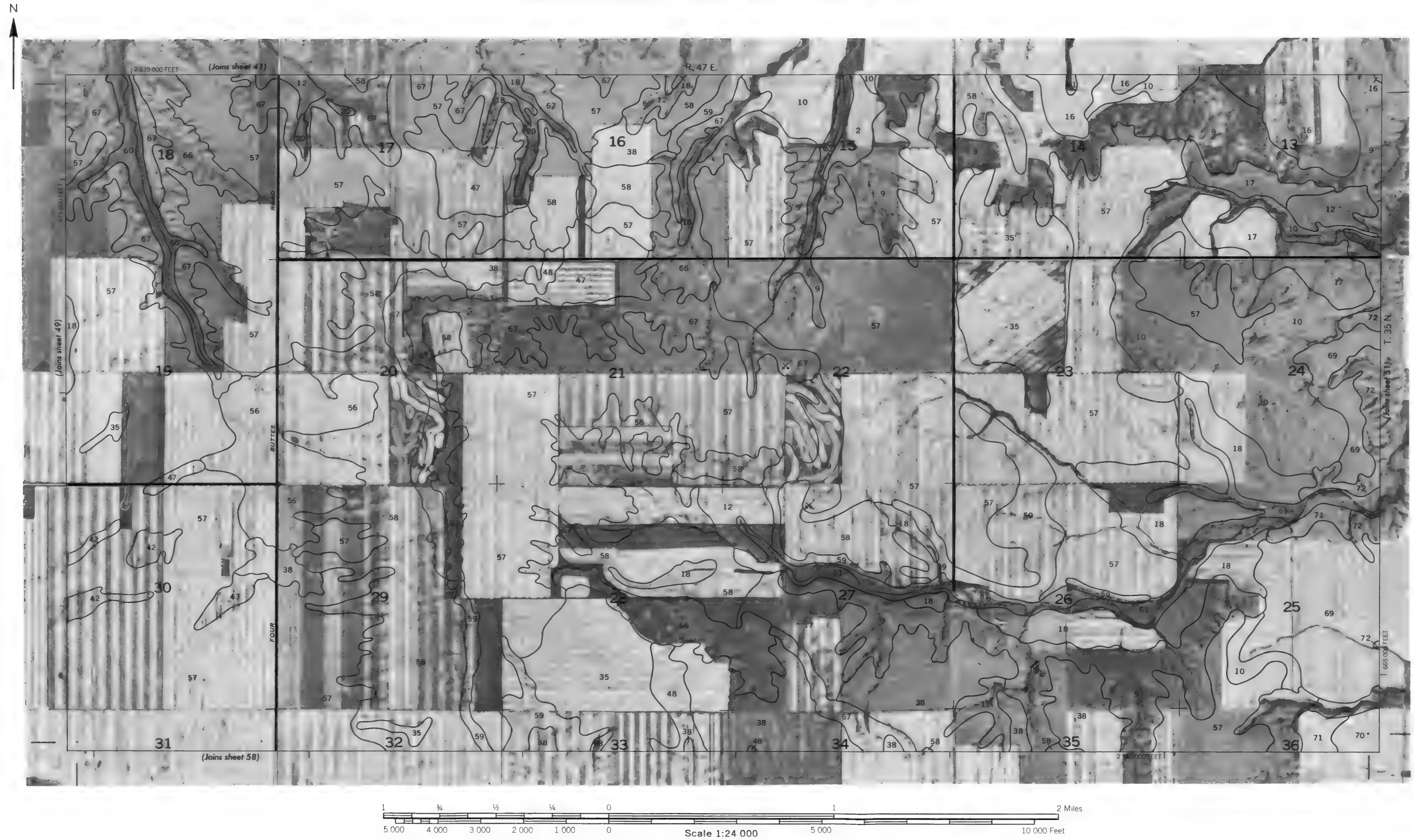
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

Coordinate grid ticks and land division corners, if shown, are approximately positioned



ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 49

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 50

51

N

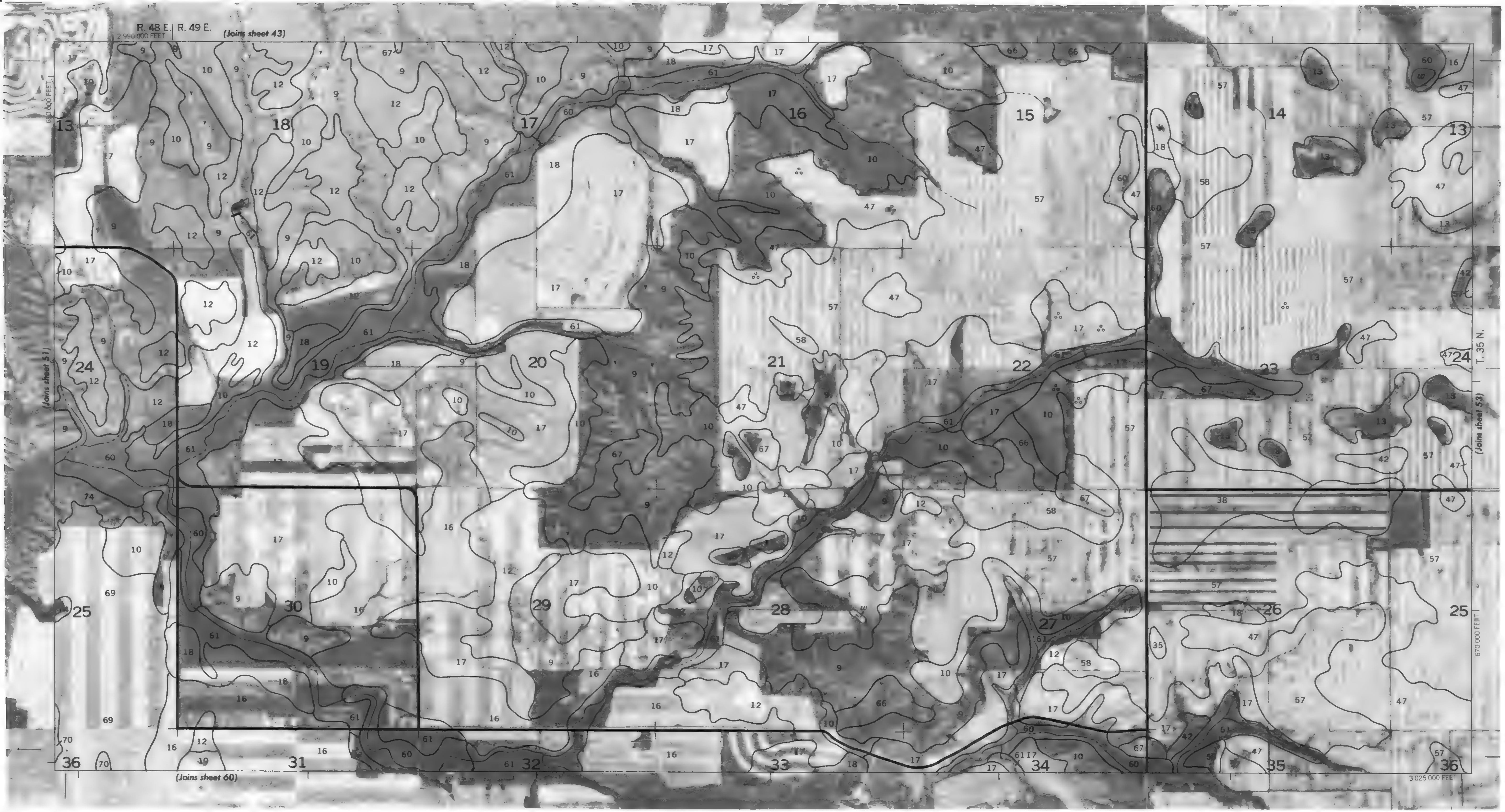
1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 52

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

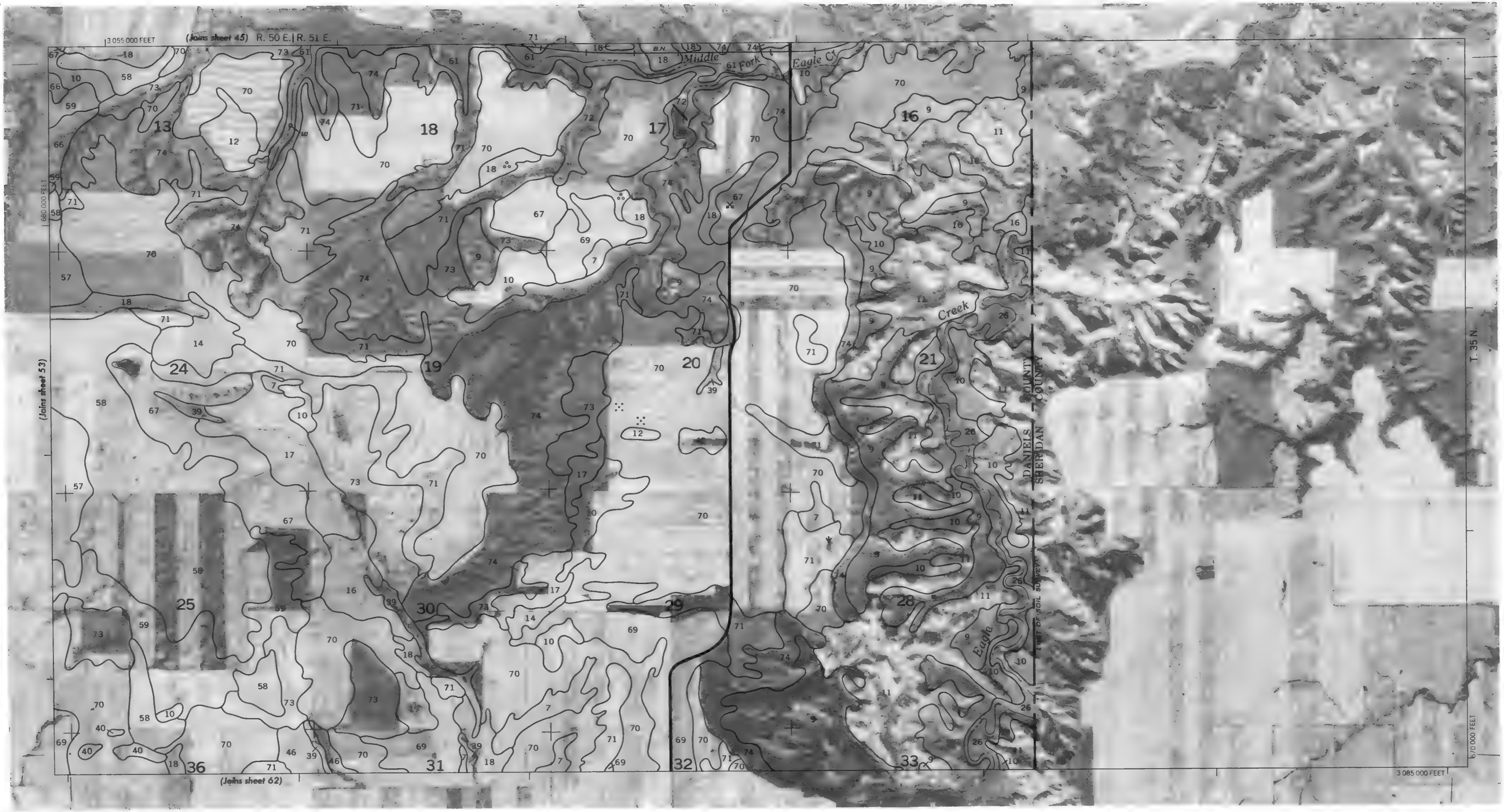
N

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 54



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

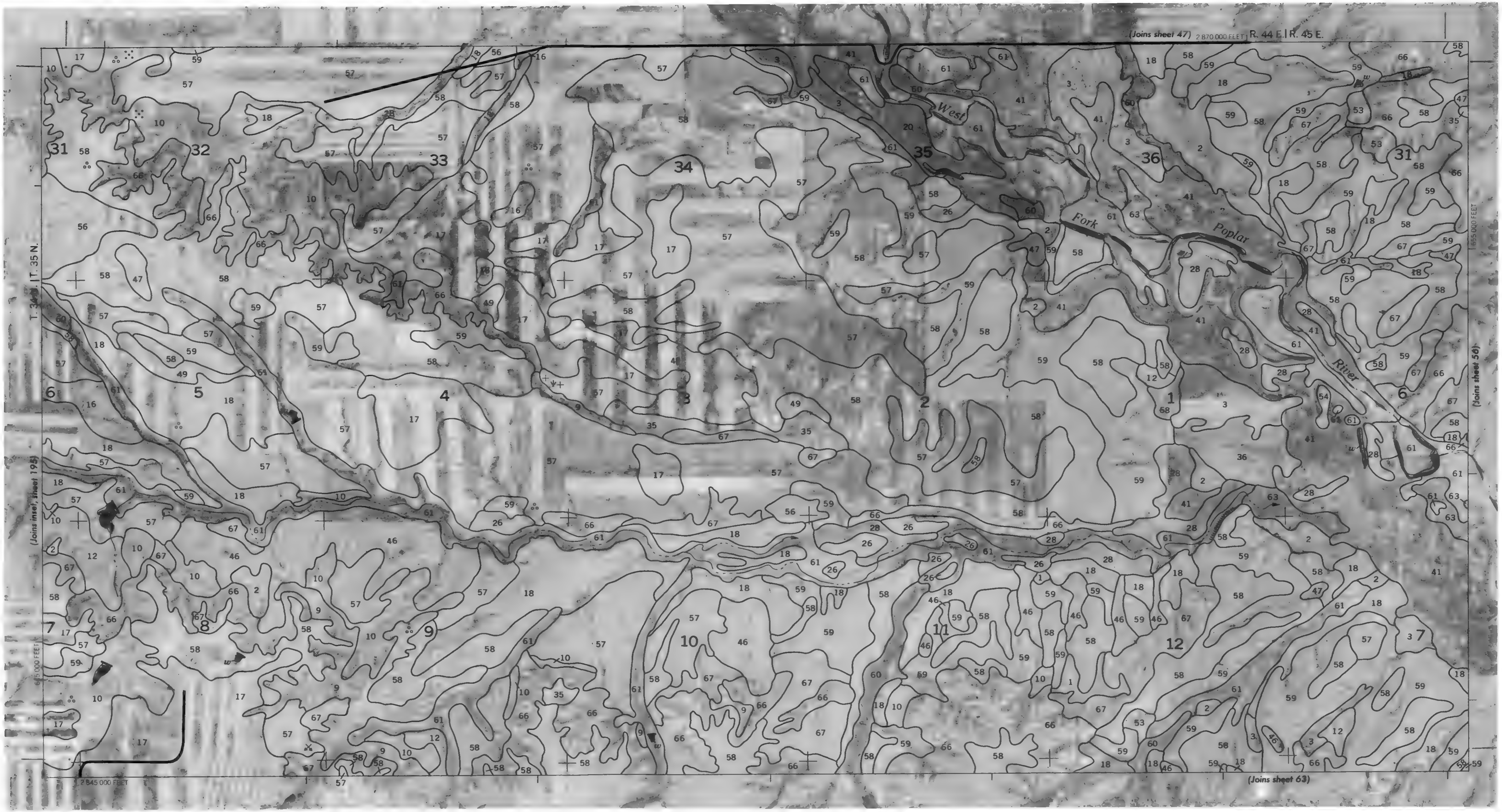
ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 54

55

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 55

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 56

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

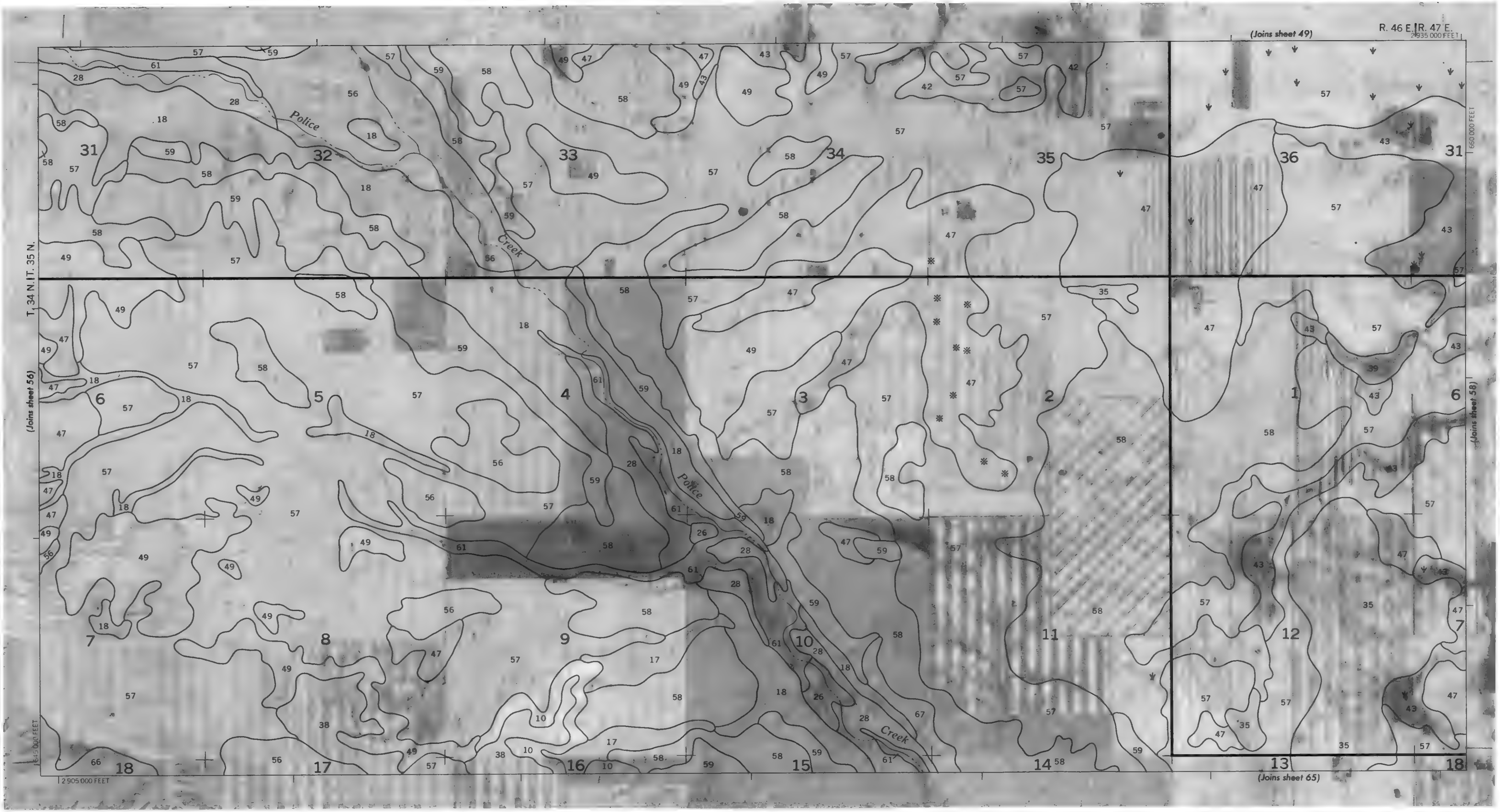
ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 56

57

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 57

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

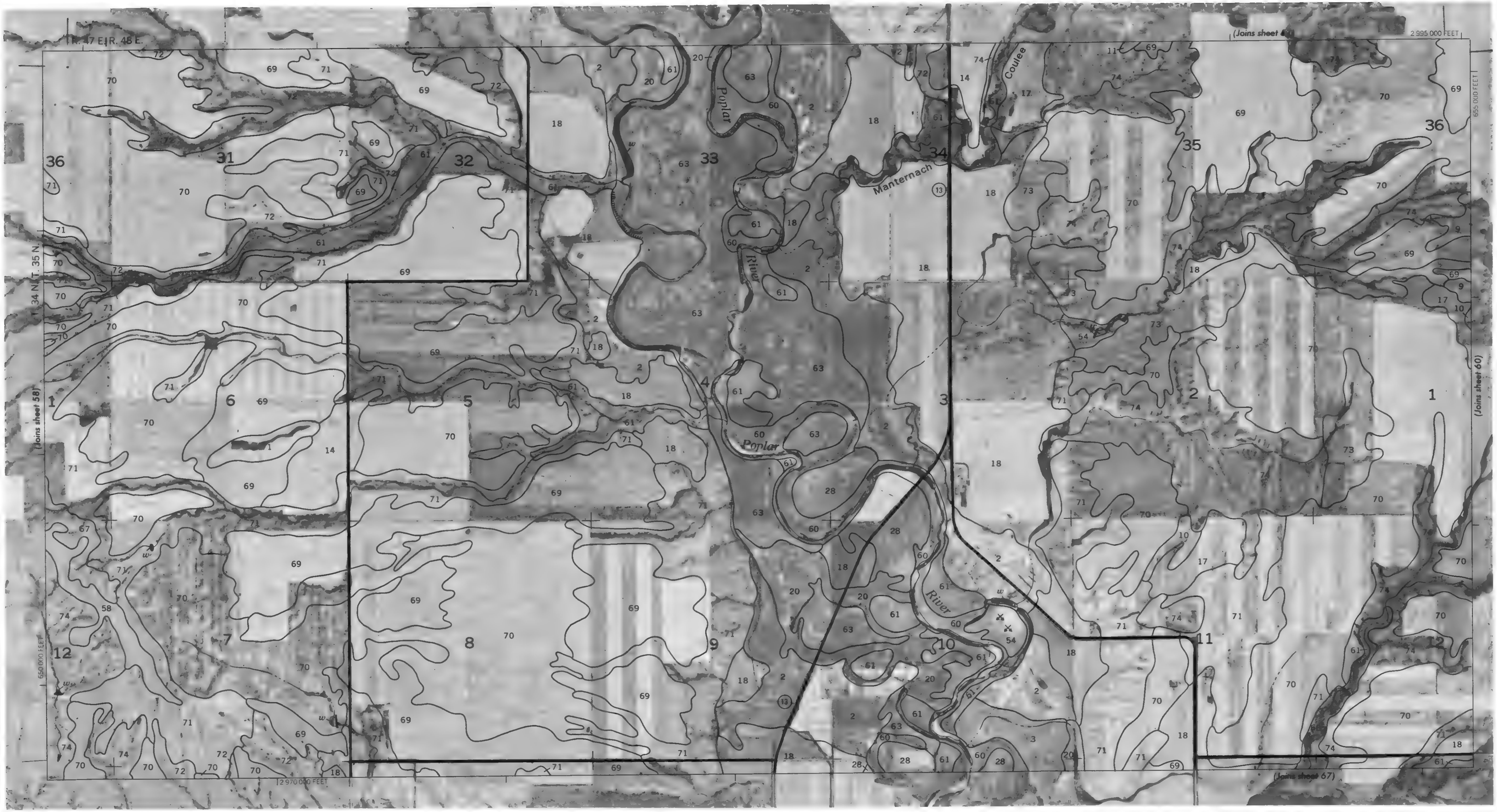
ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 58

59

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 59

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



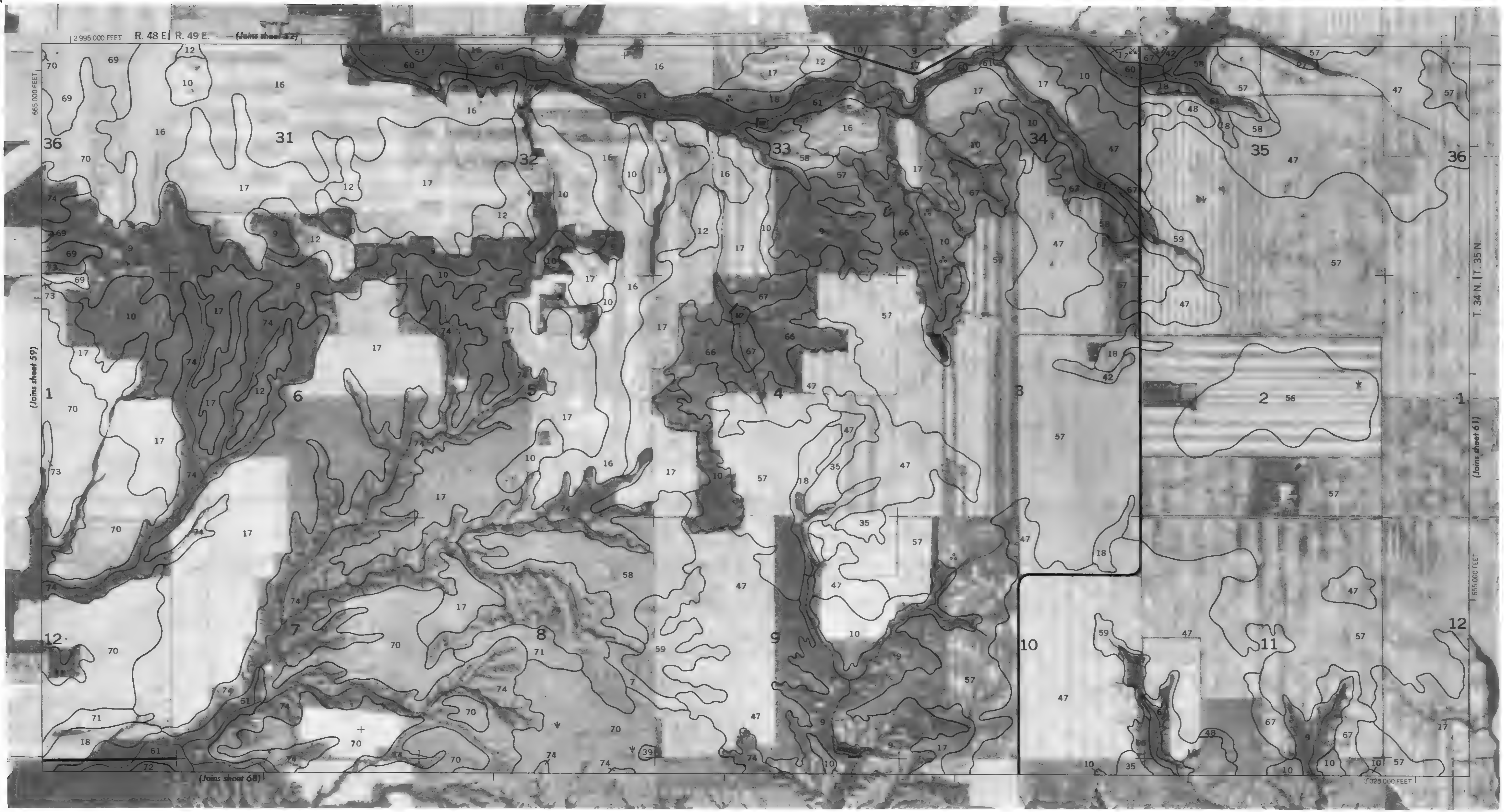
1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 60

N



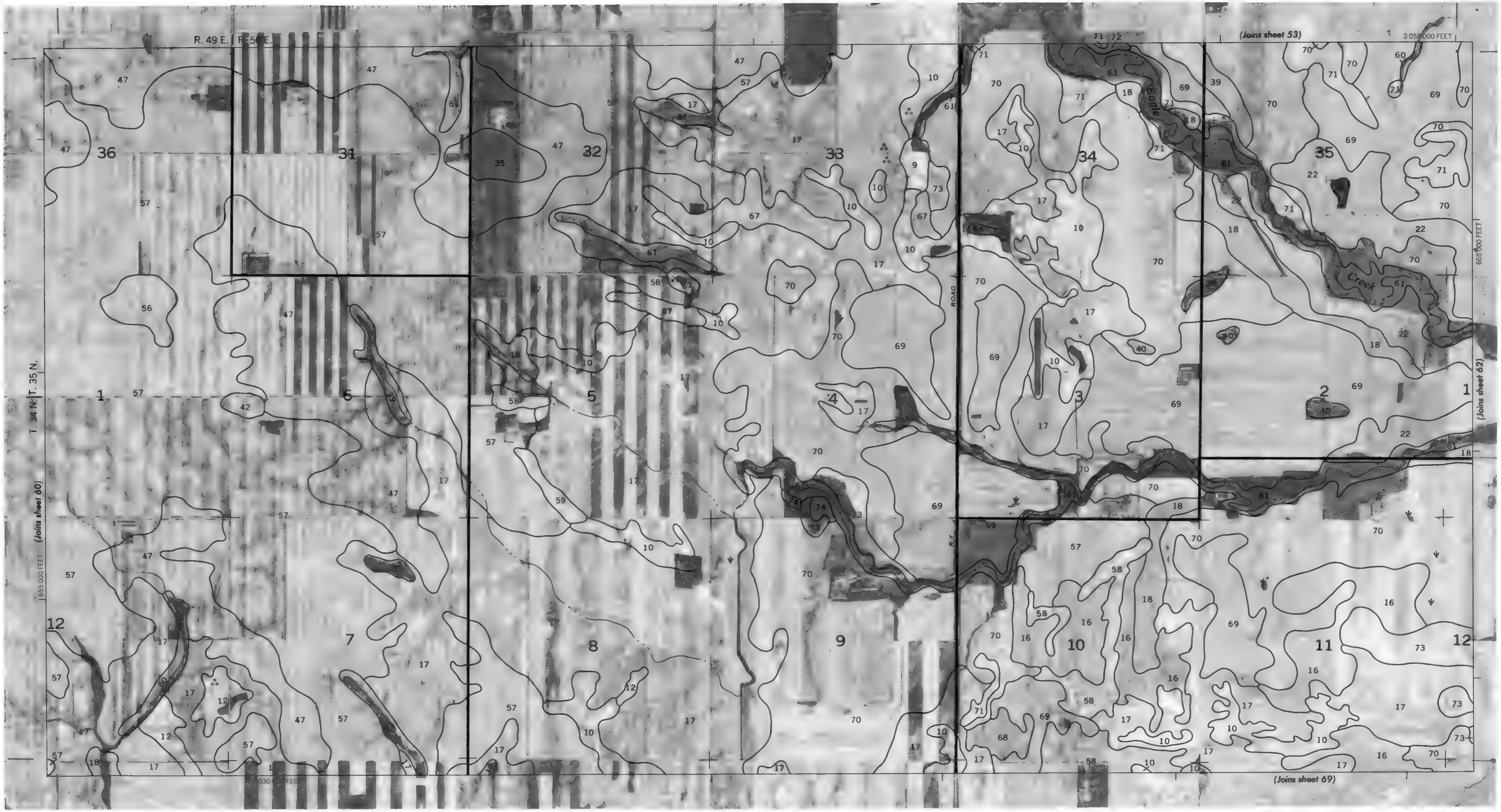
1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 60



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 61

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 62

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

4000 AND 5000-FOOT GRID TICKS

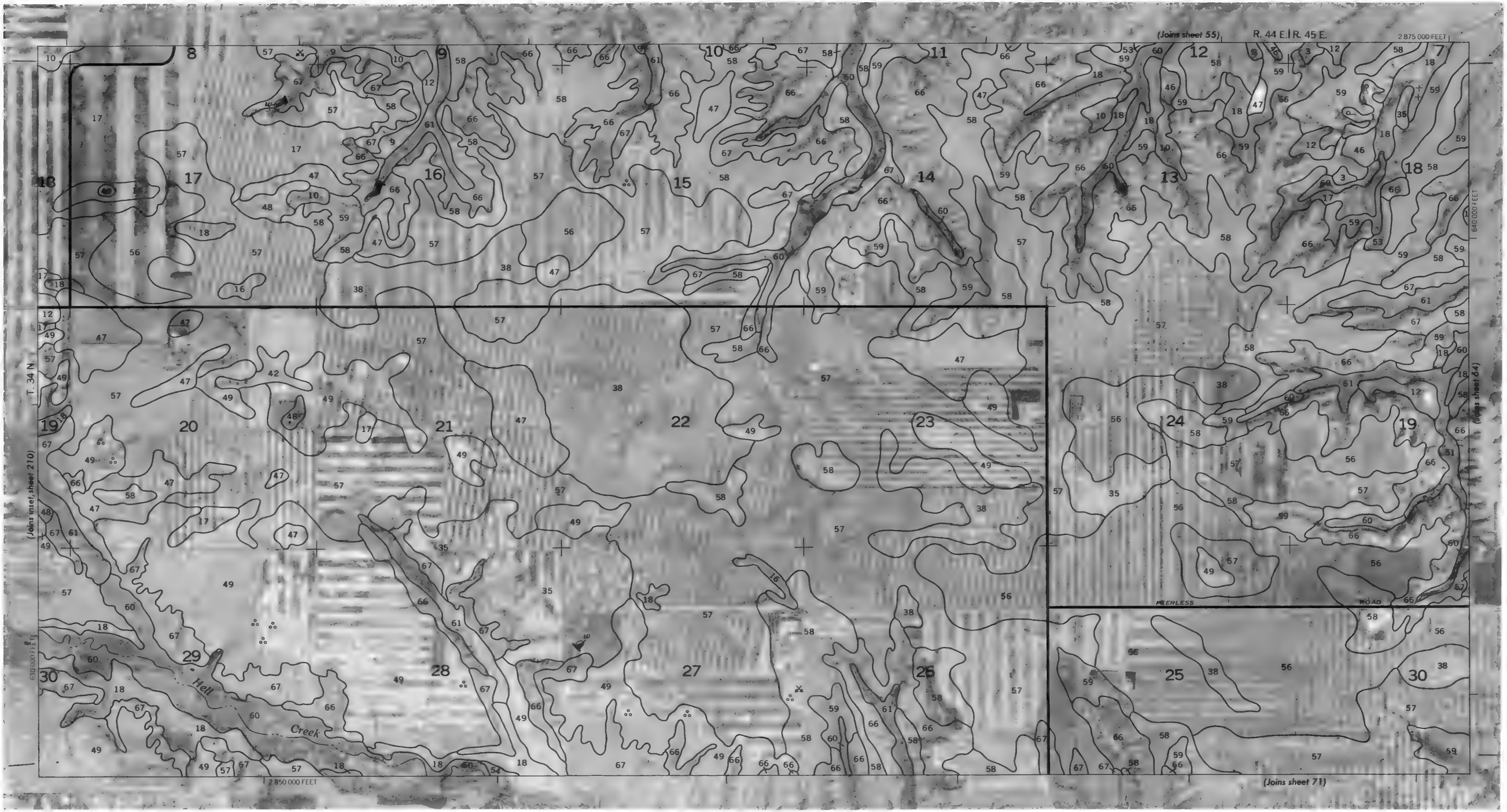
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

63

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 63

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N

1 ¾ ½ ¼ 0 1 2 Miles

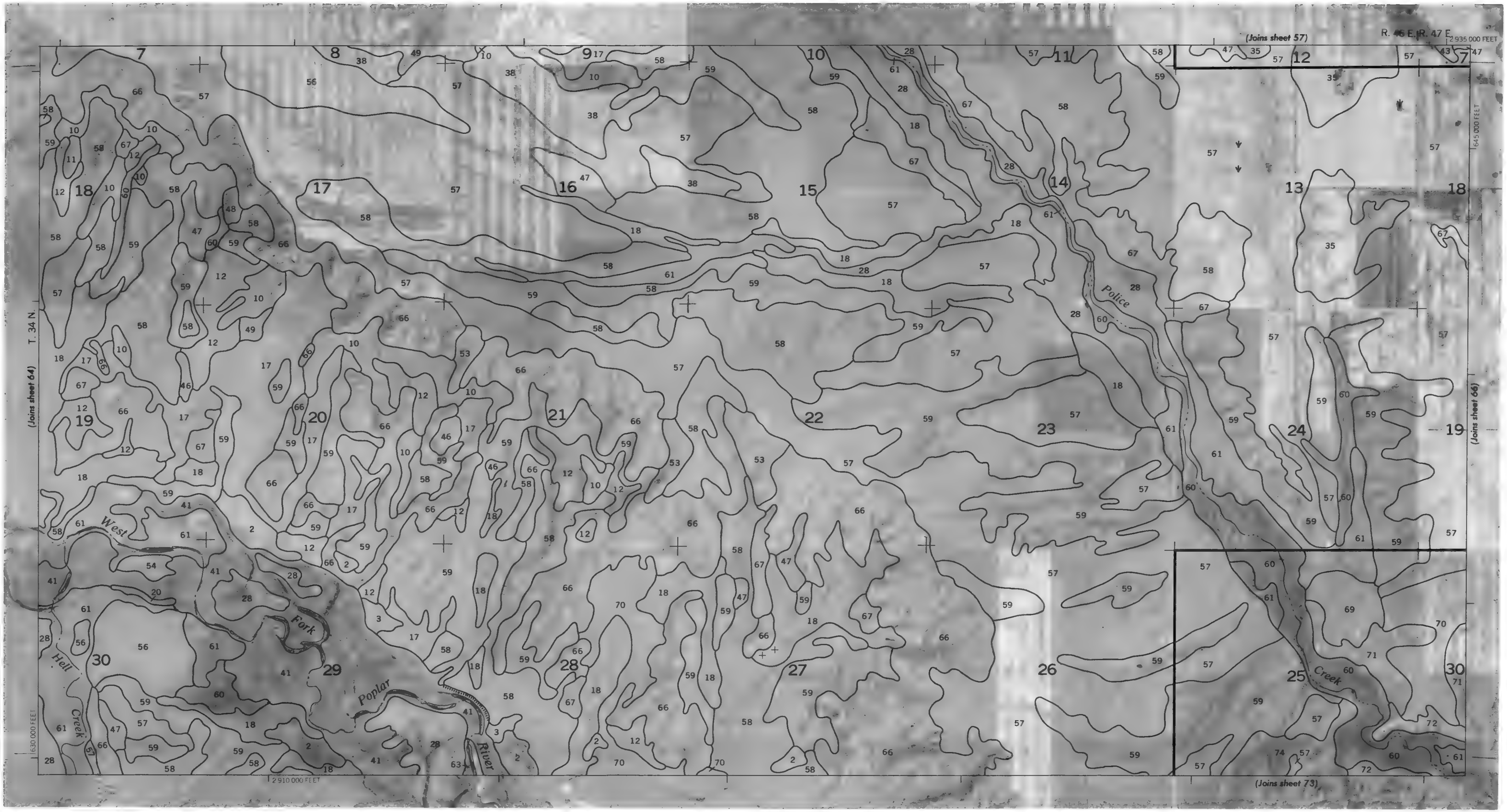
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 65

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 66

N

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

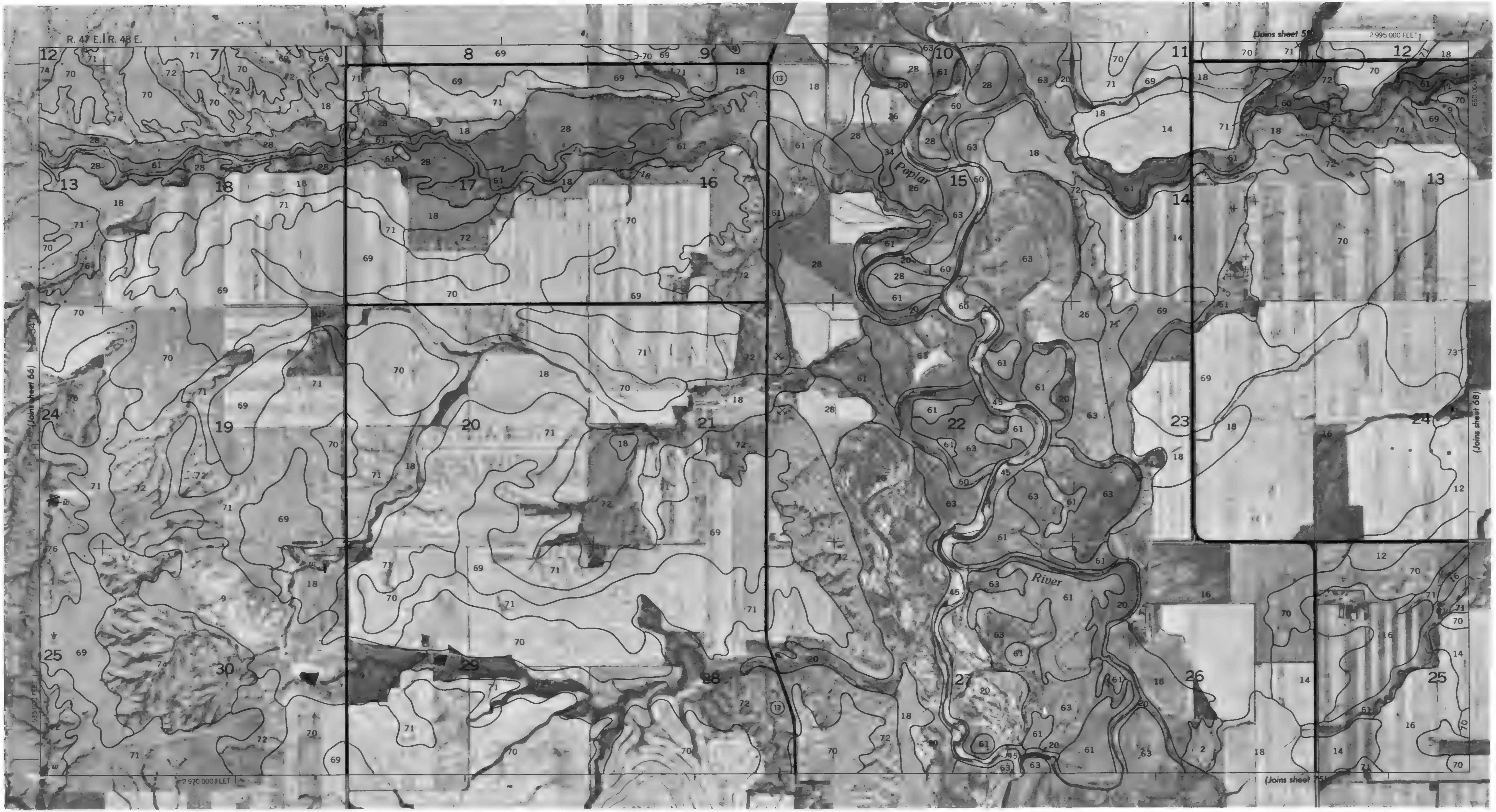
ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 66

67

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 67

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned



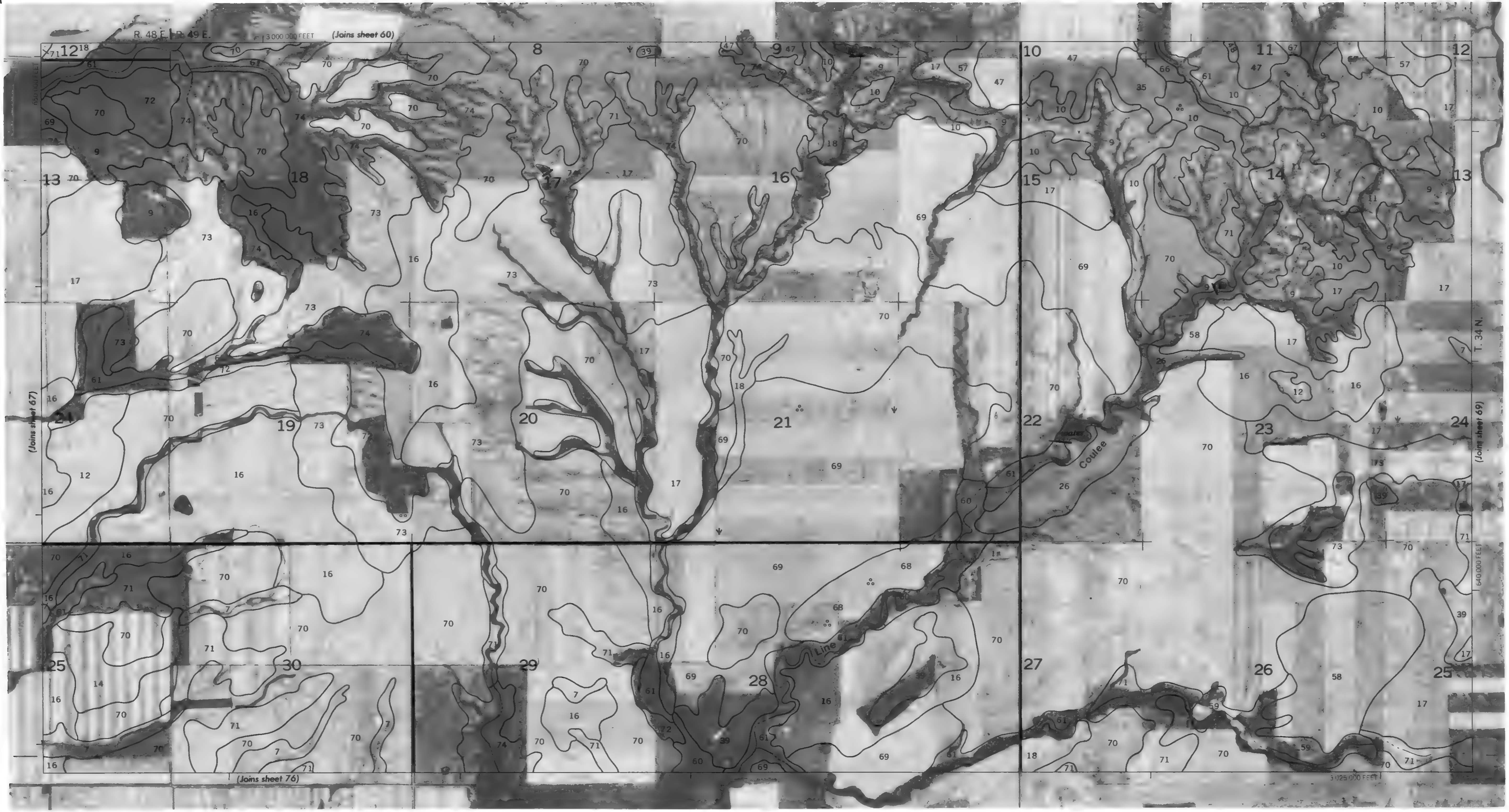
1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 68

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

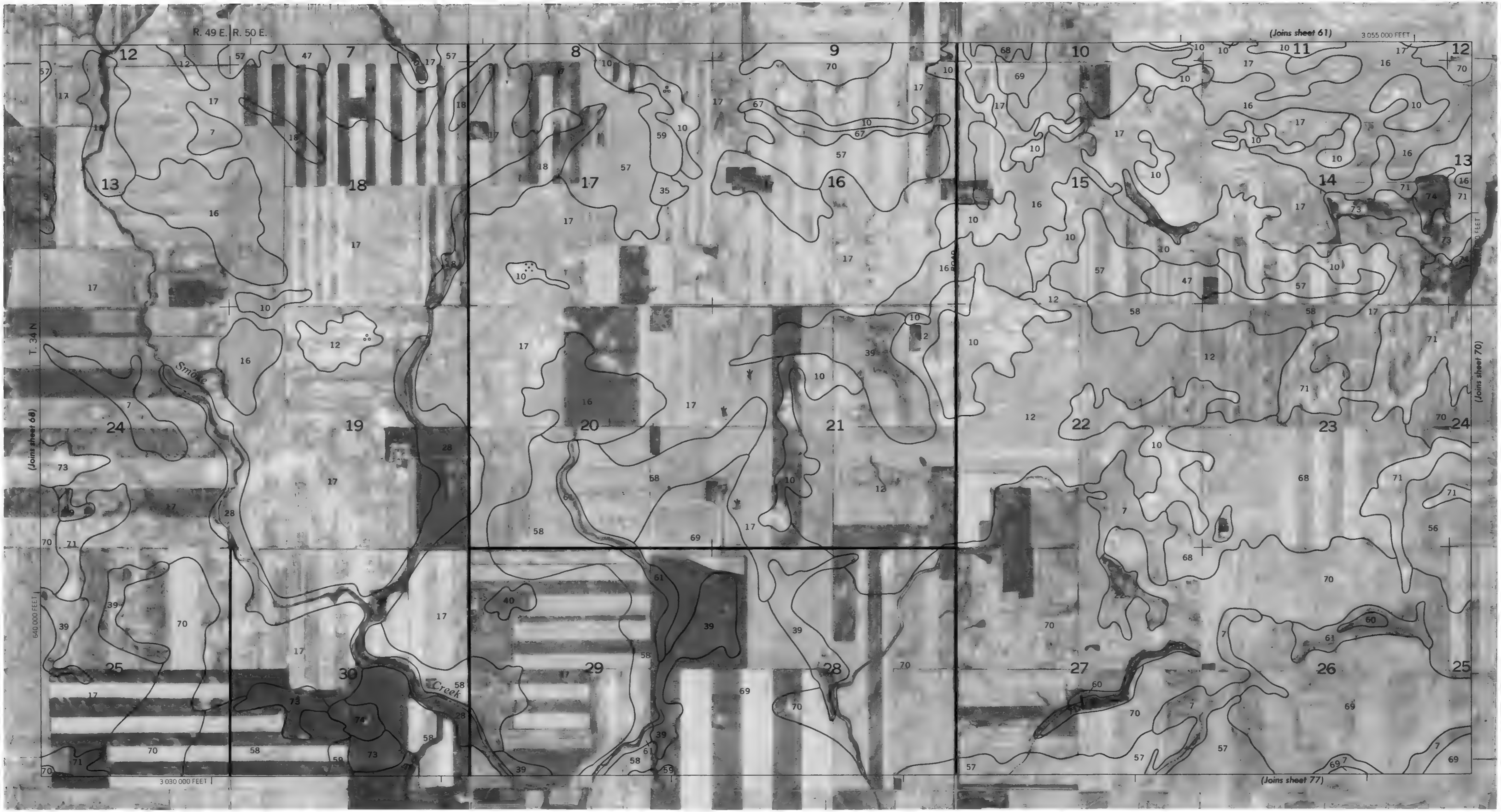
Coordinate grid ticks and land division corners, if shown, are approximately positioned

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 69

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned

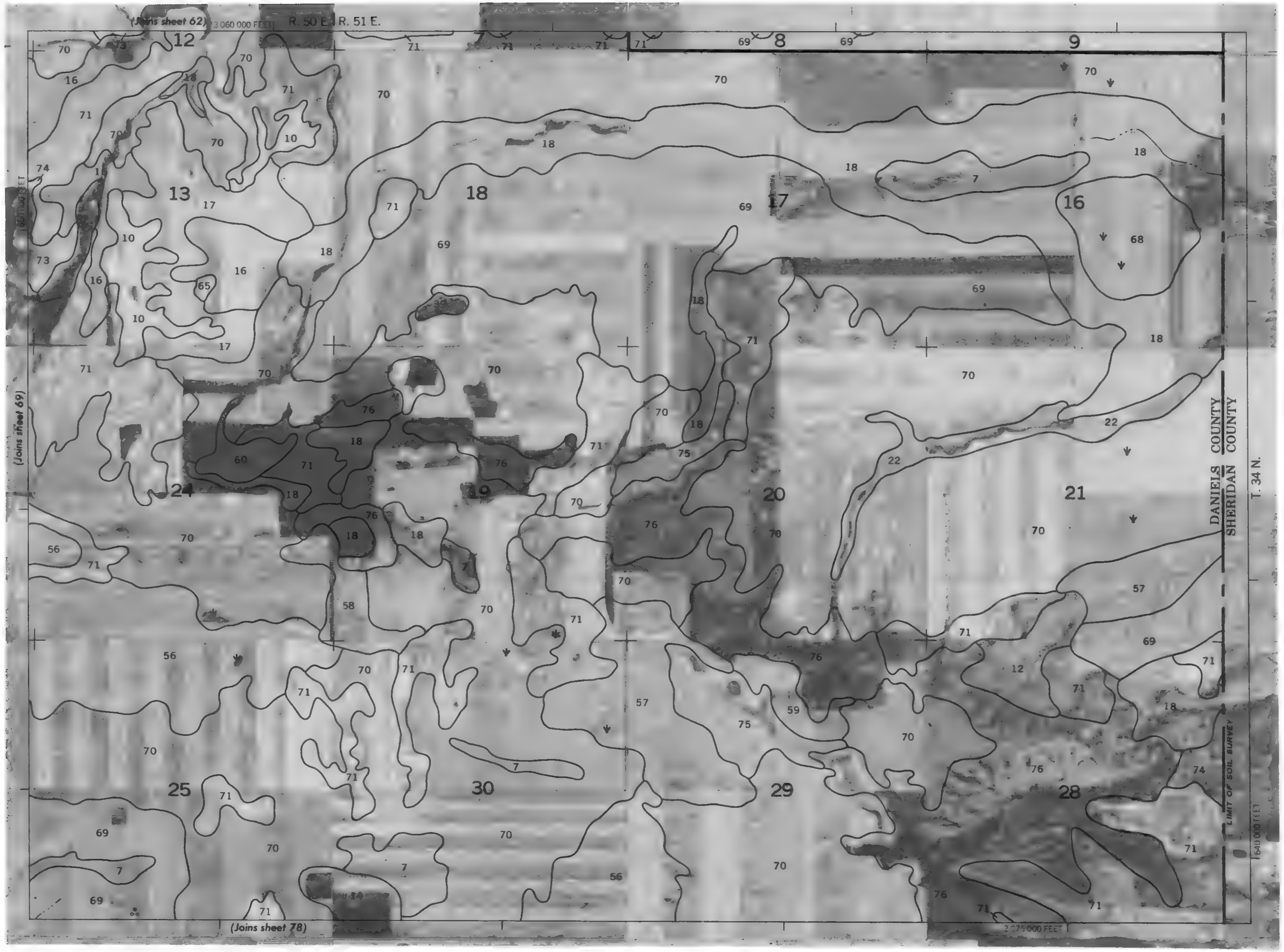


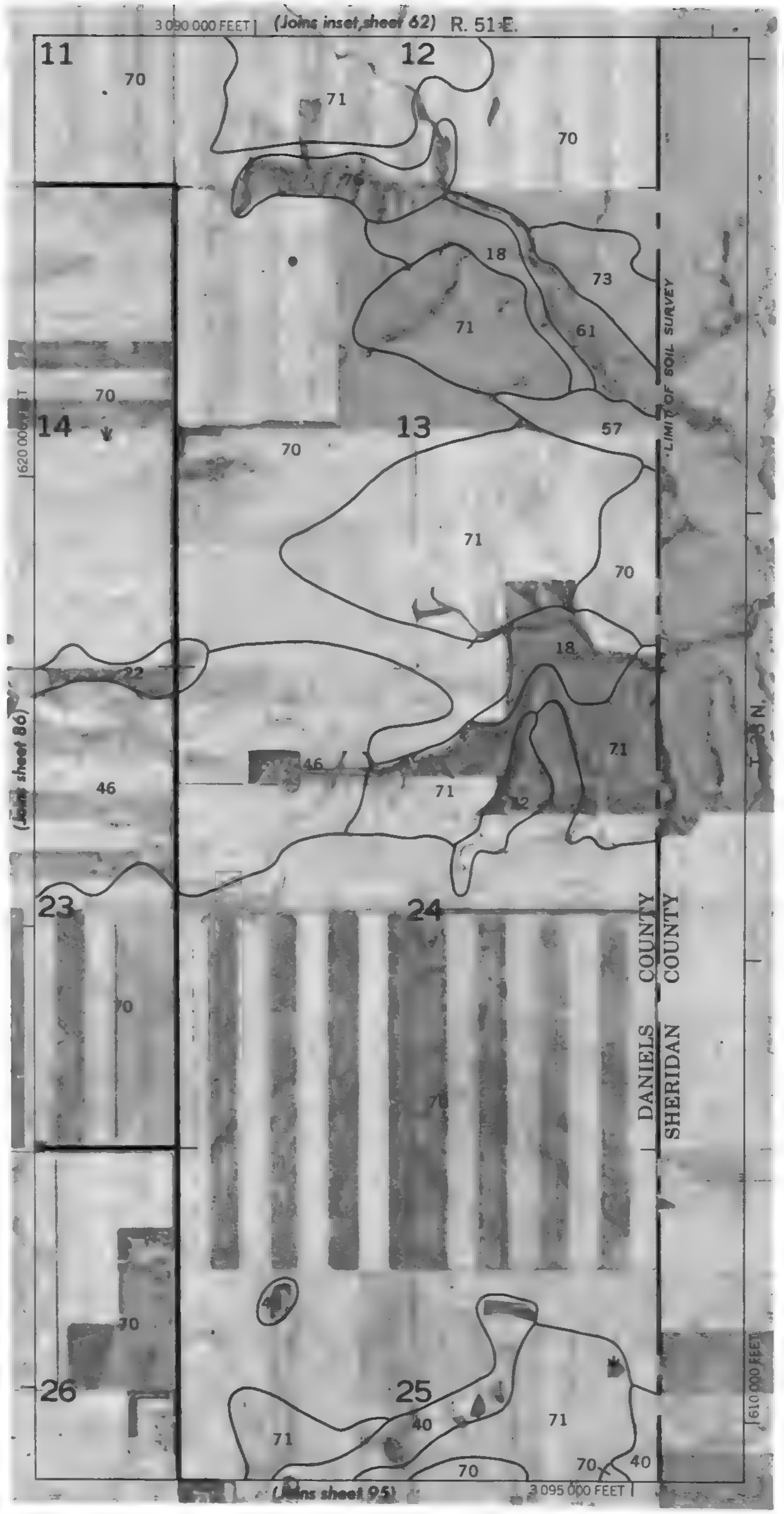
1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N





1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

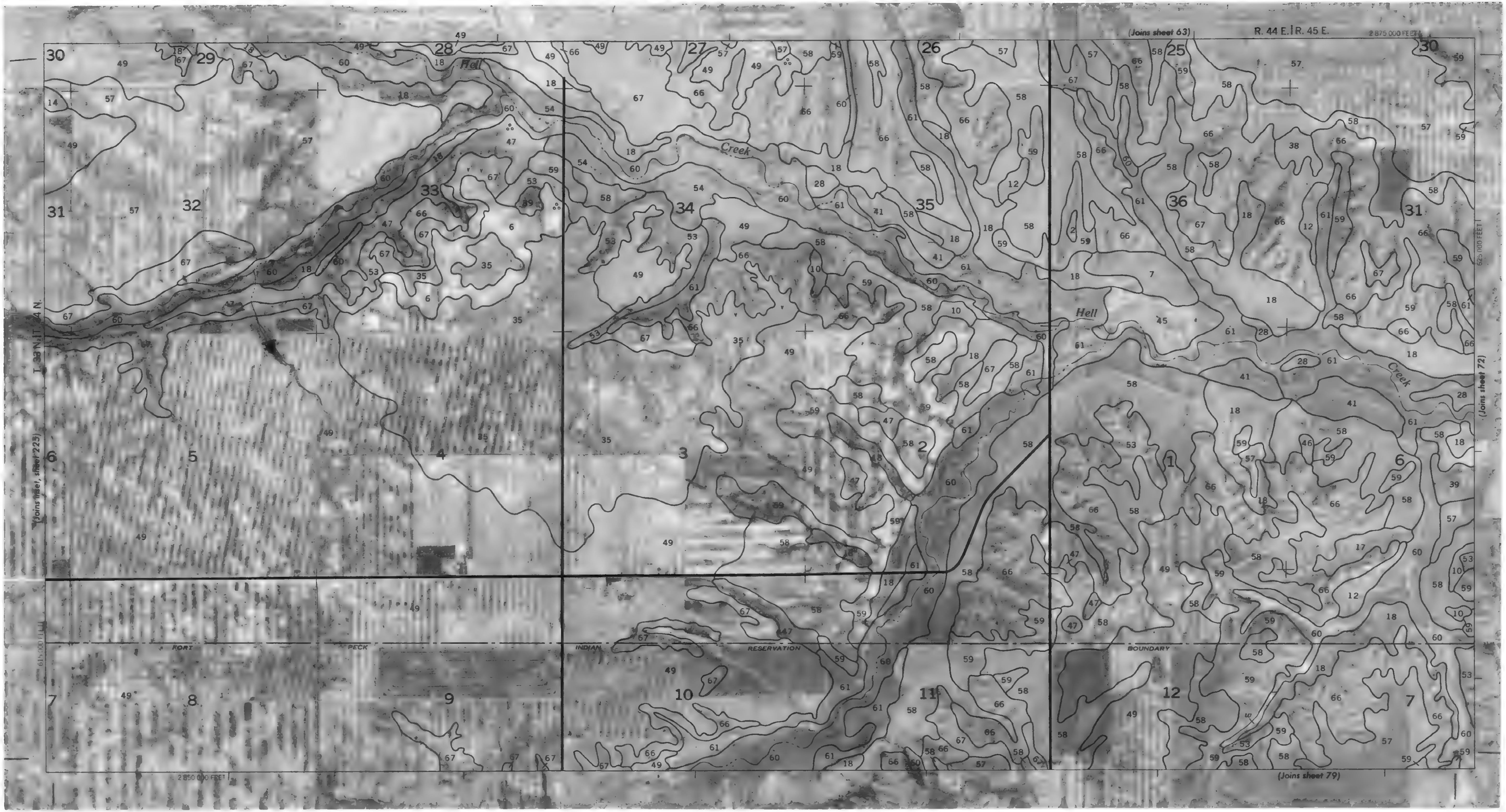
Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 70

N



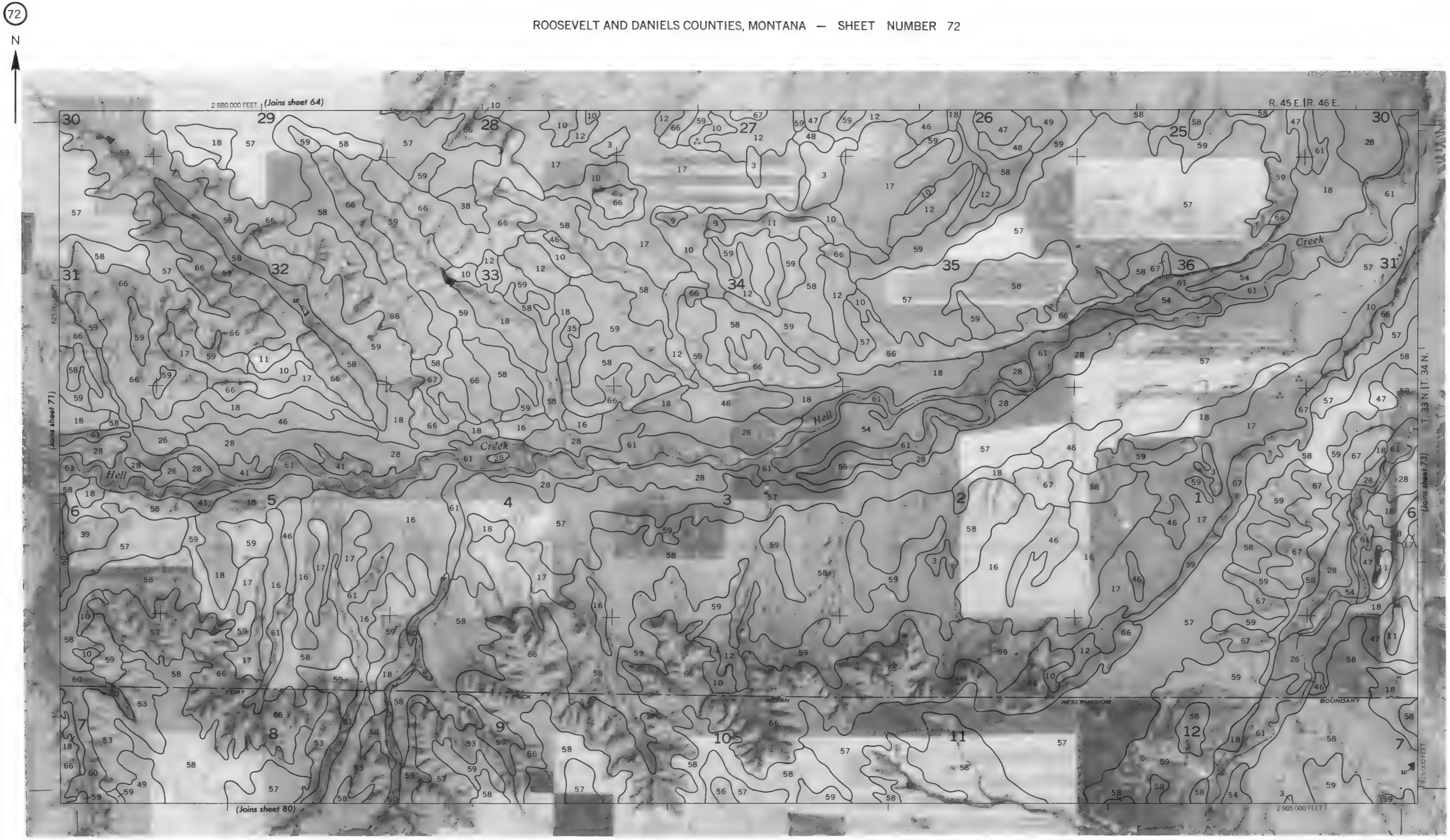
1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 71

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned



1 ¾ ½ ¼ 0 1 2 Miles

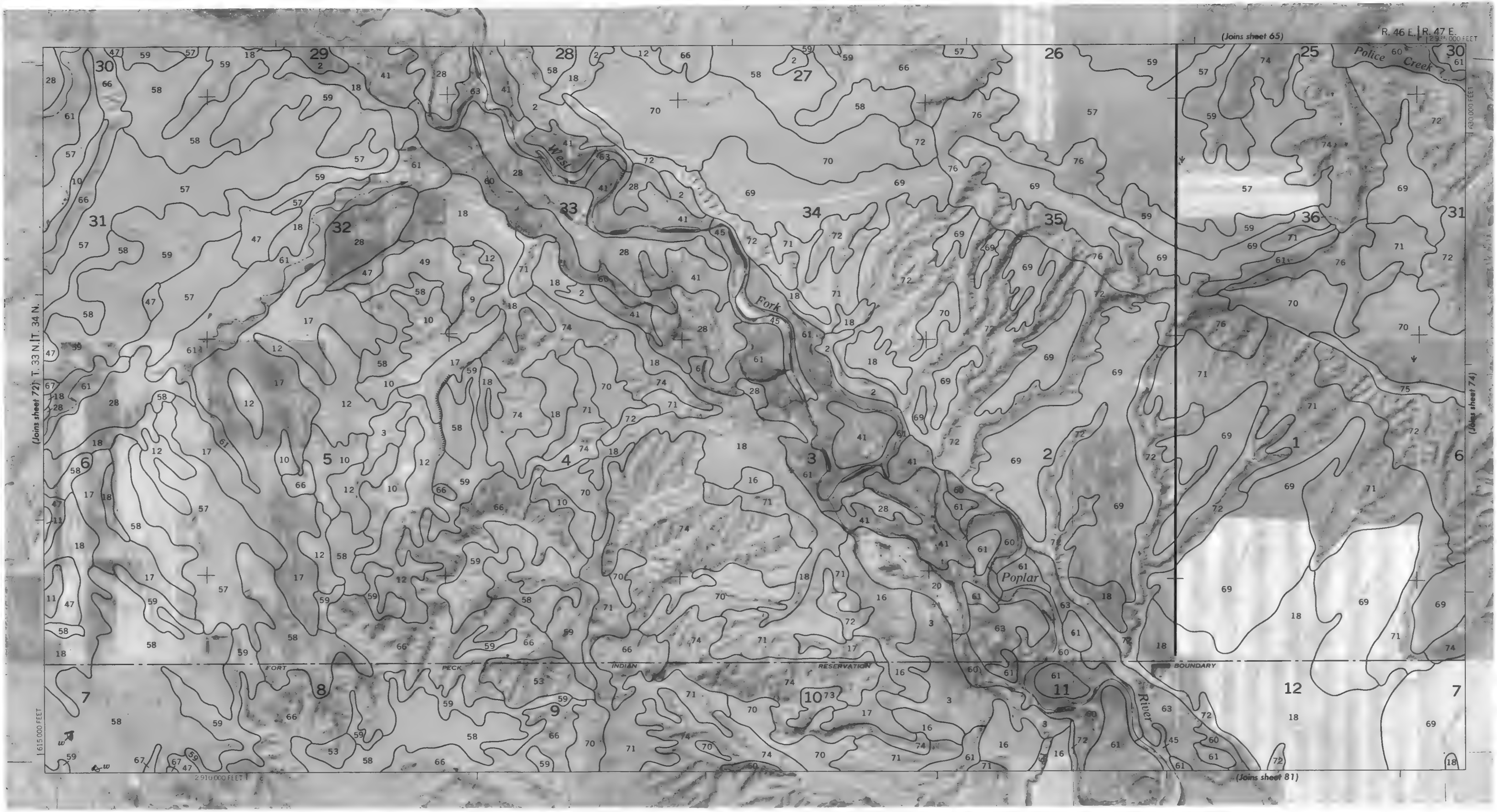
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

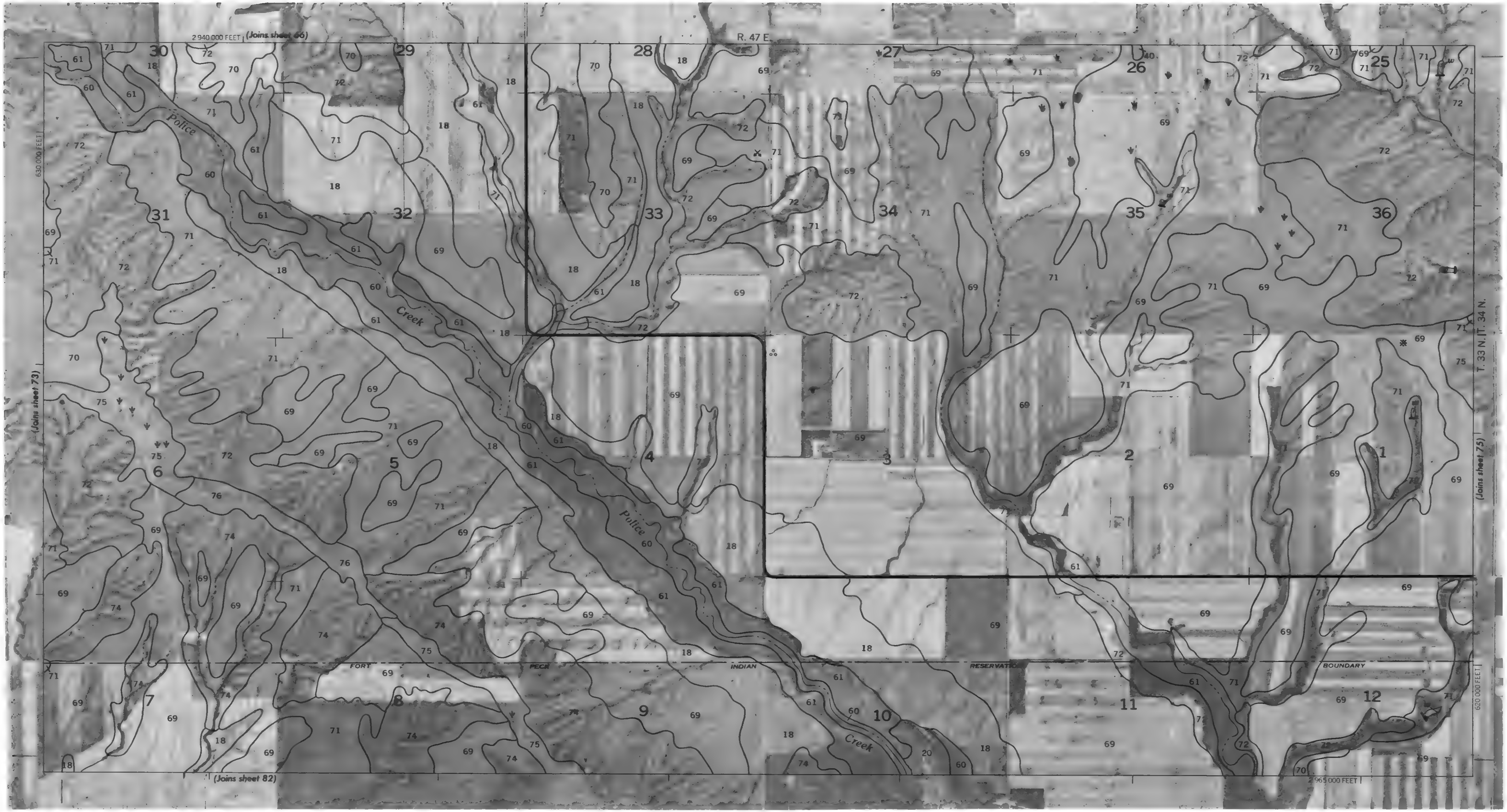
Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 73

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 74



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 74

75

N

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

Scale 1:24 000

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 76

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 77

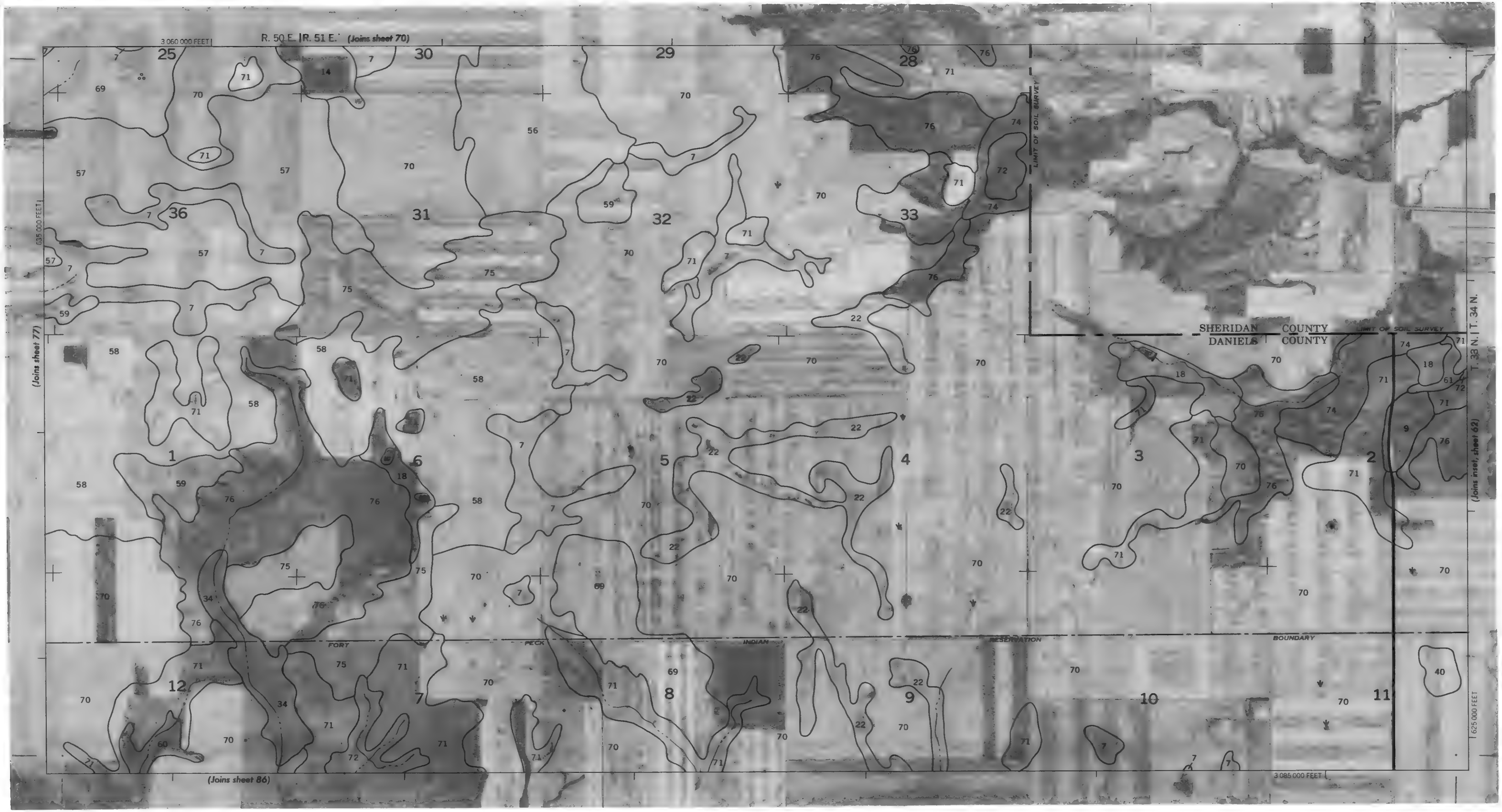
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.

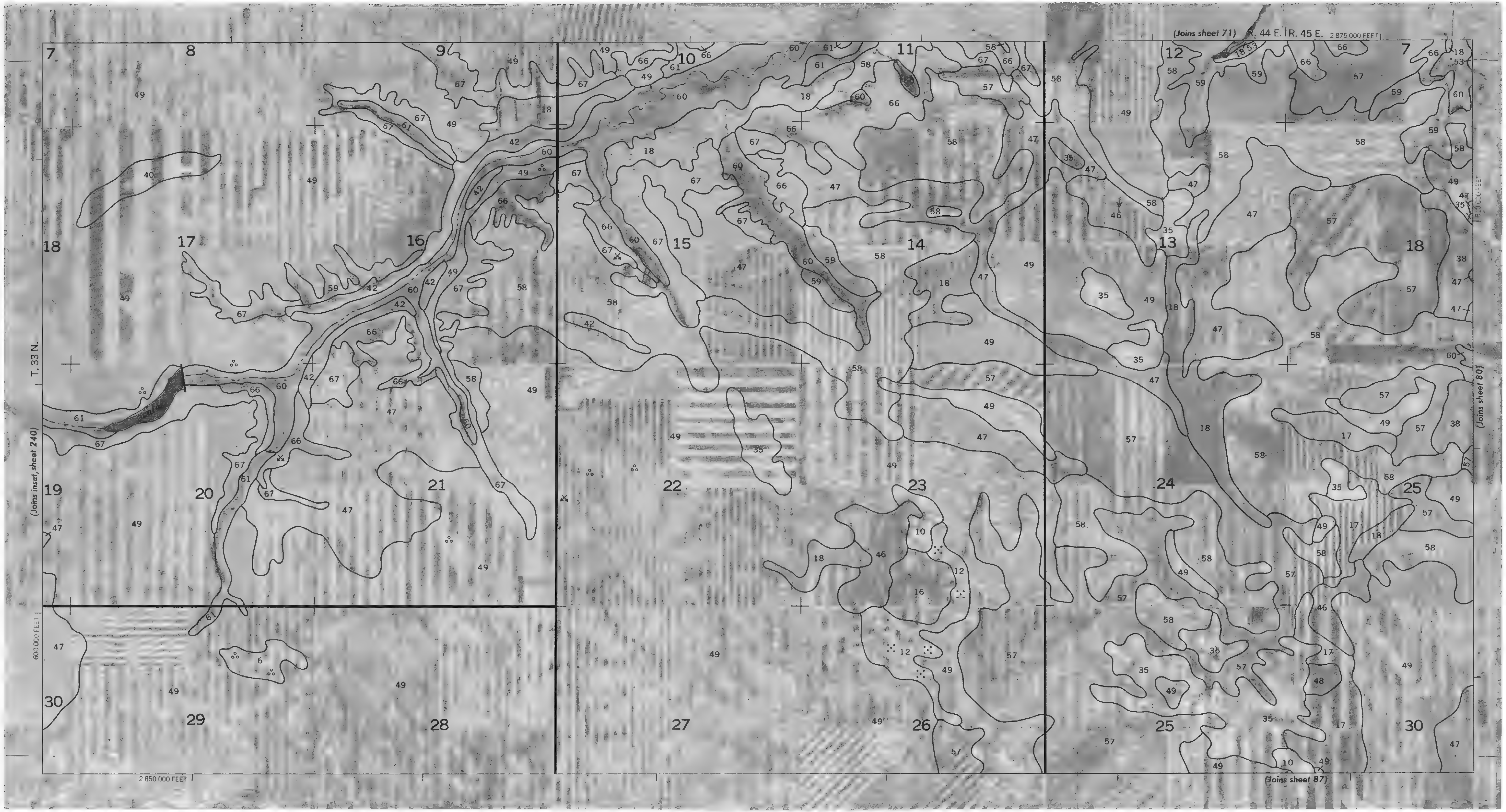
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 78

79

N

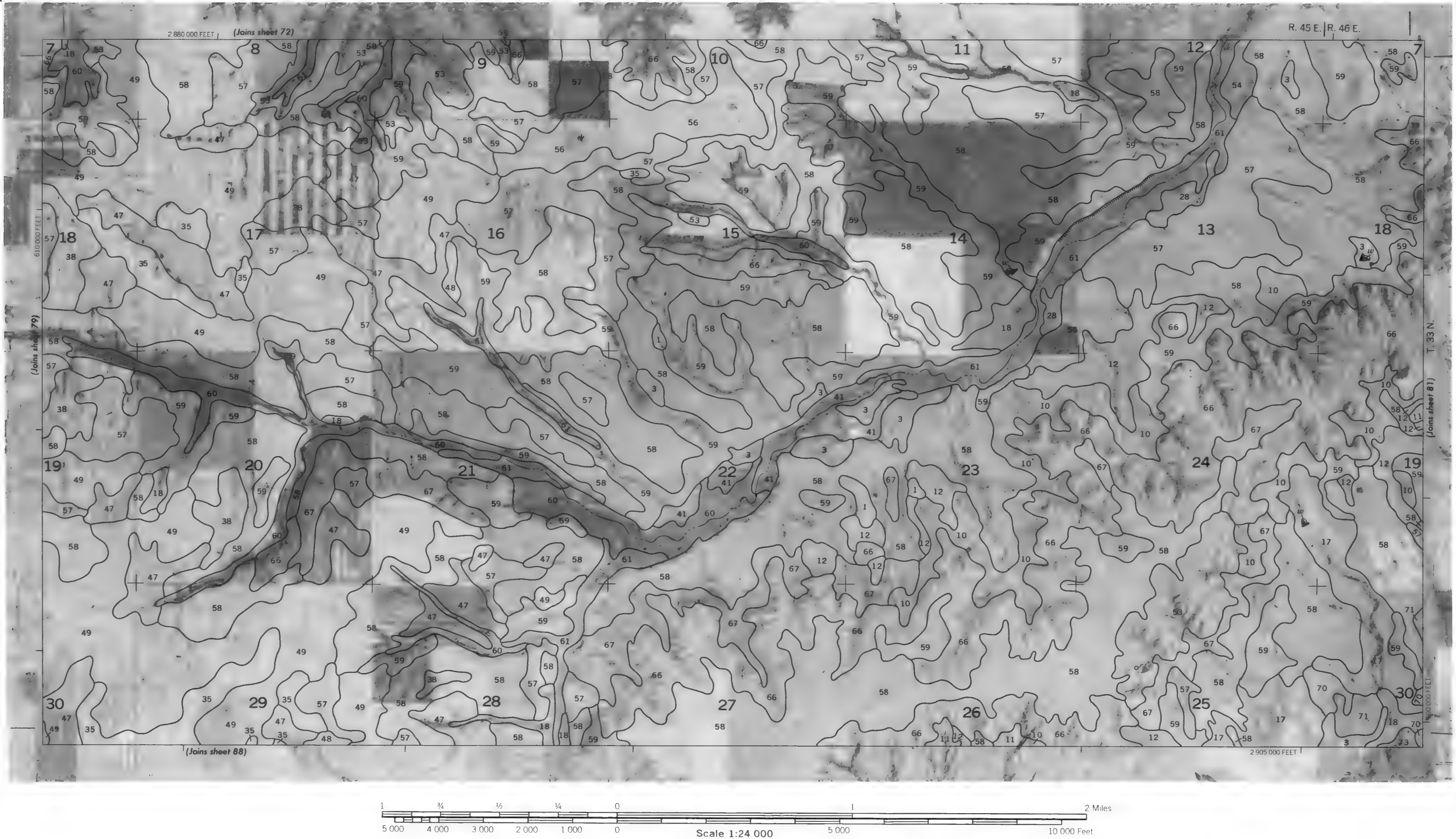
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

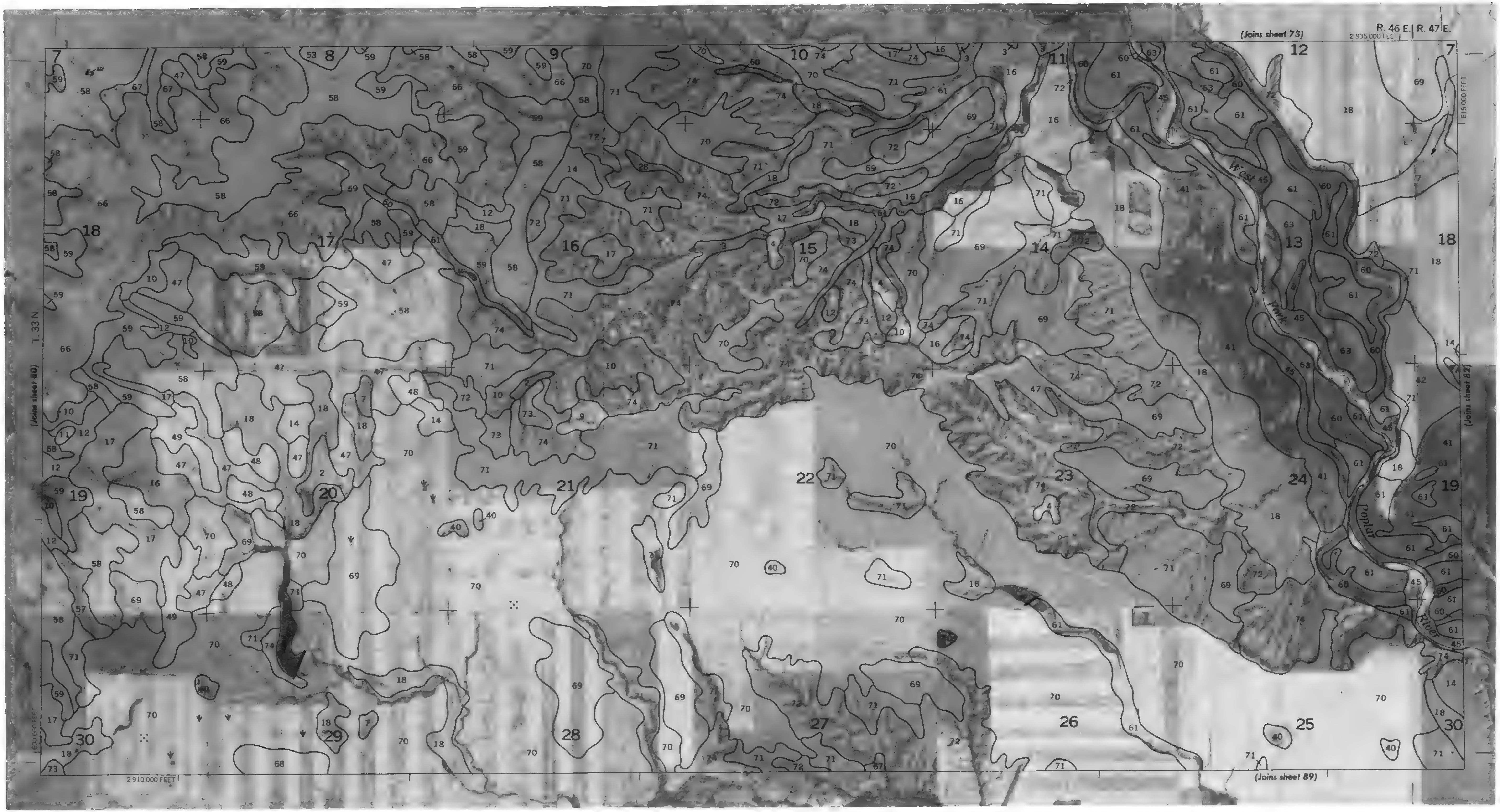


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 81

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

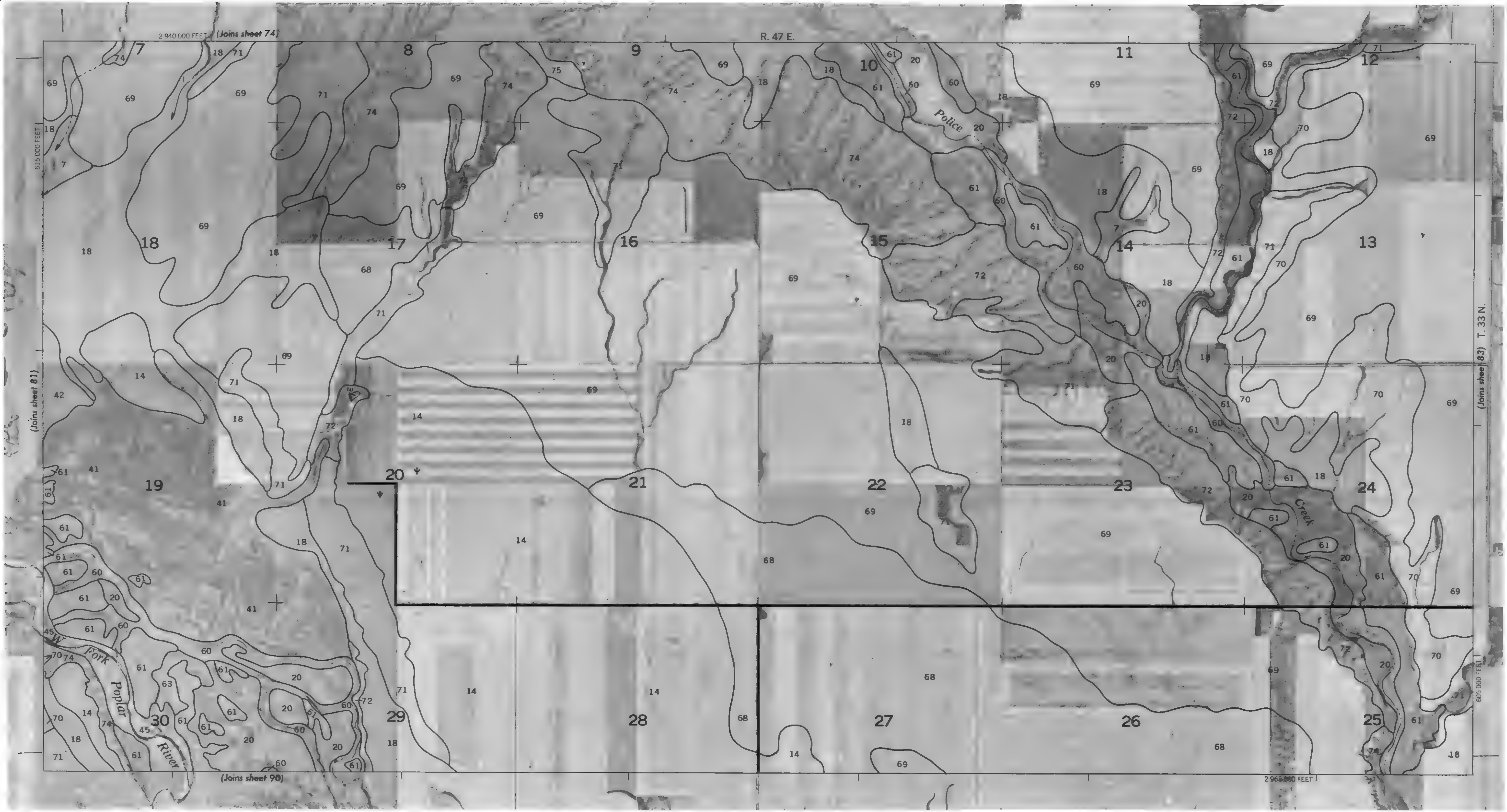


1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

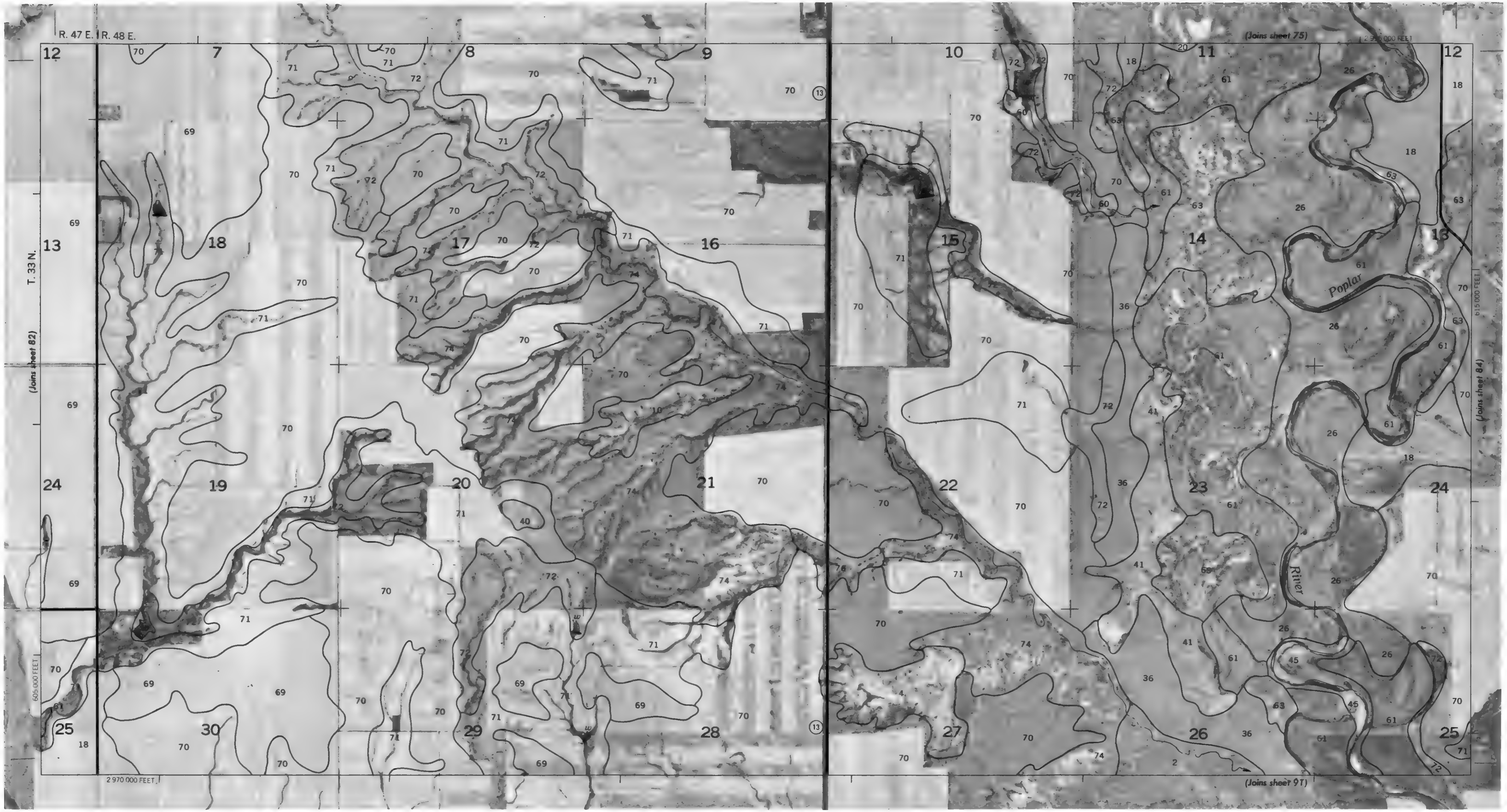
Coordinate grid ticks and land division corners, if shown, are approximately positioned

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 83

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

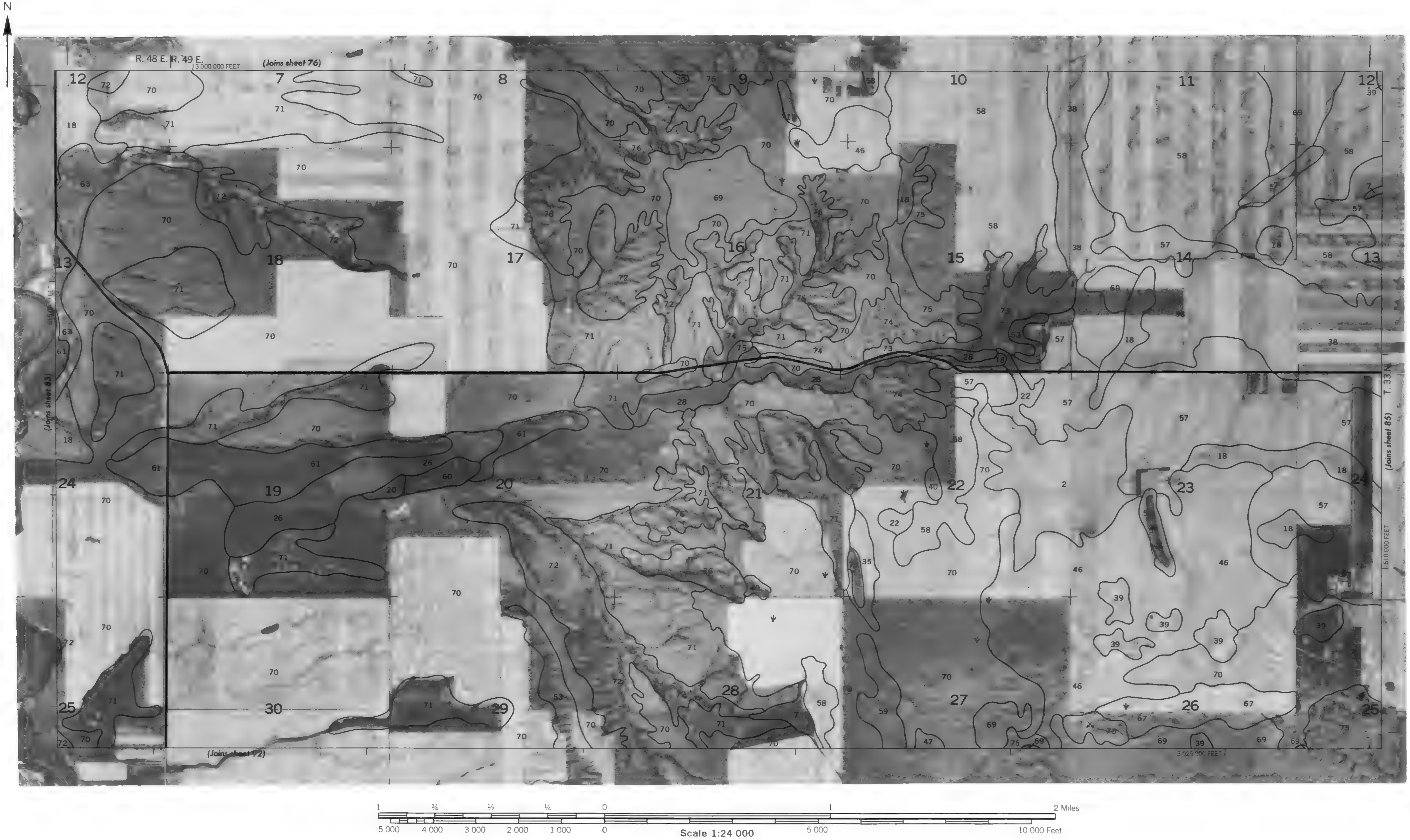
N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

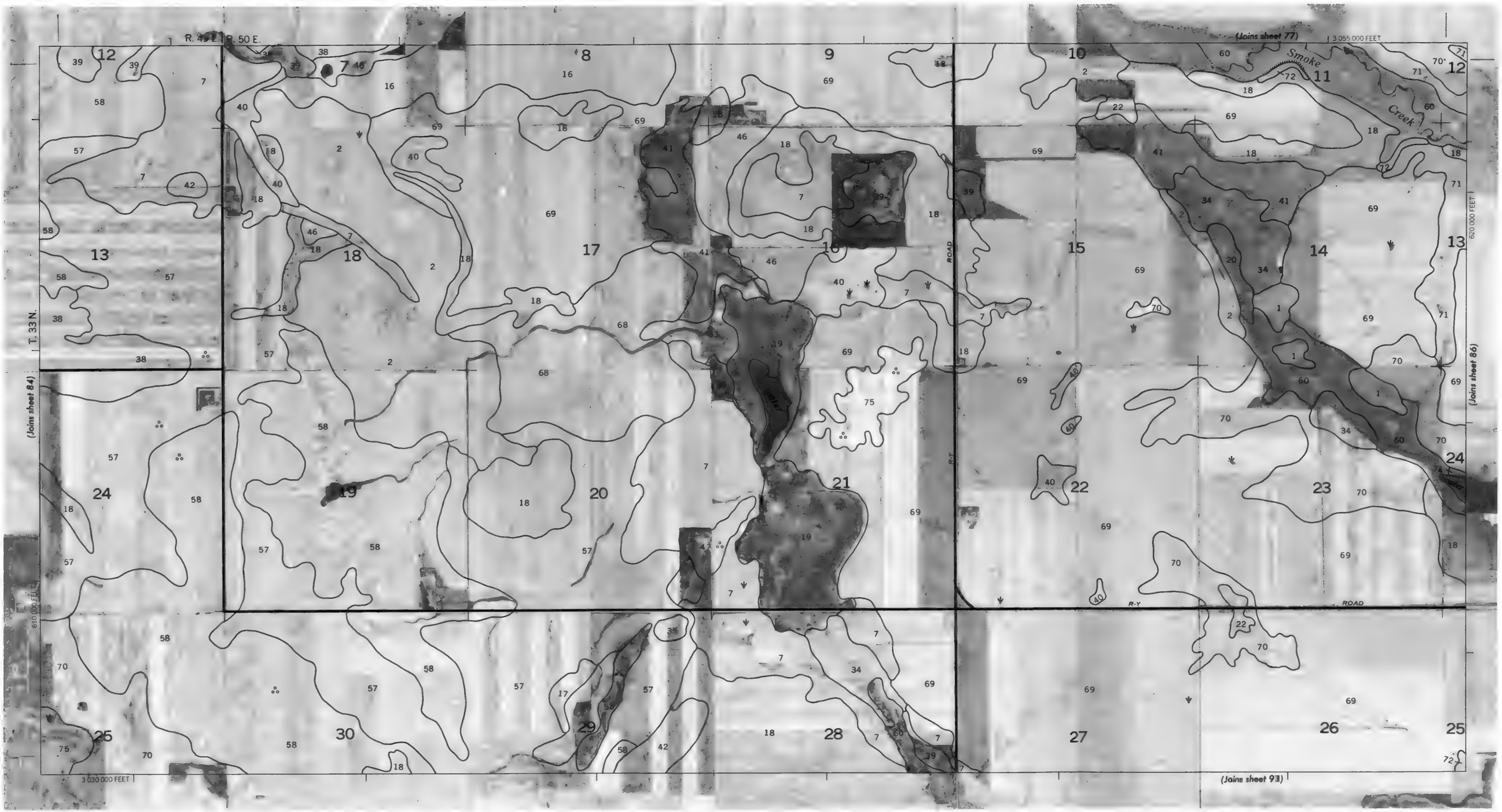
Scale 1:24 000



Coordinate grid ticks and land division corners, if shown, are approximately positioned

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

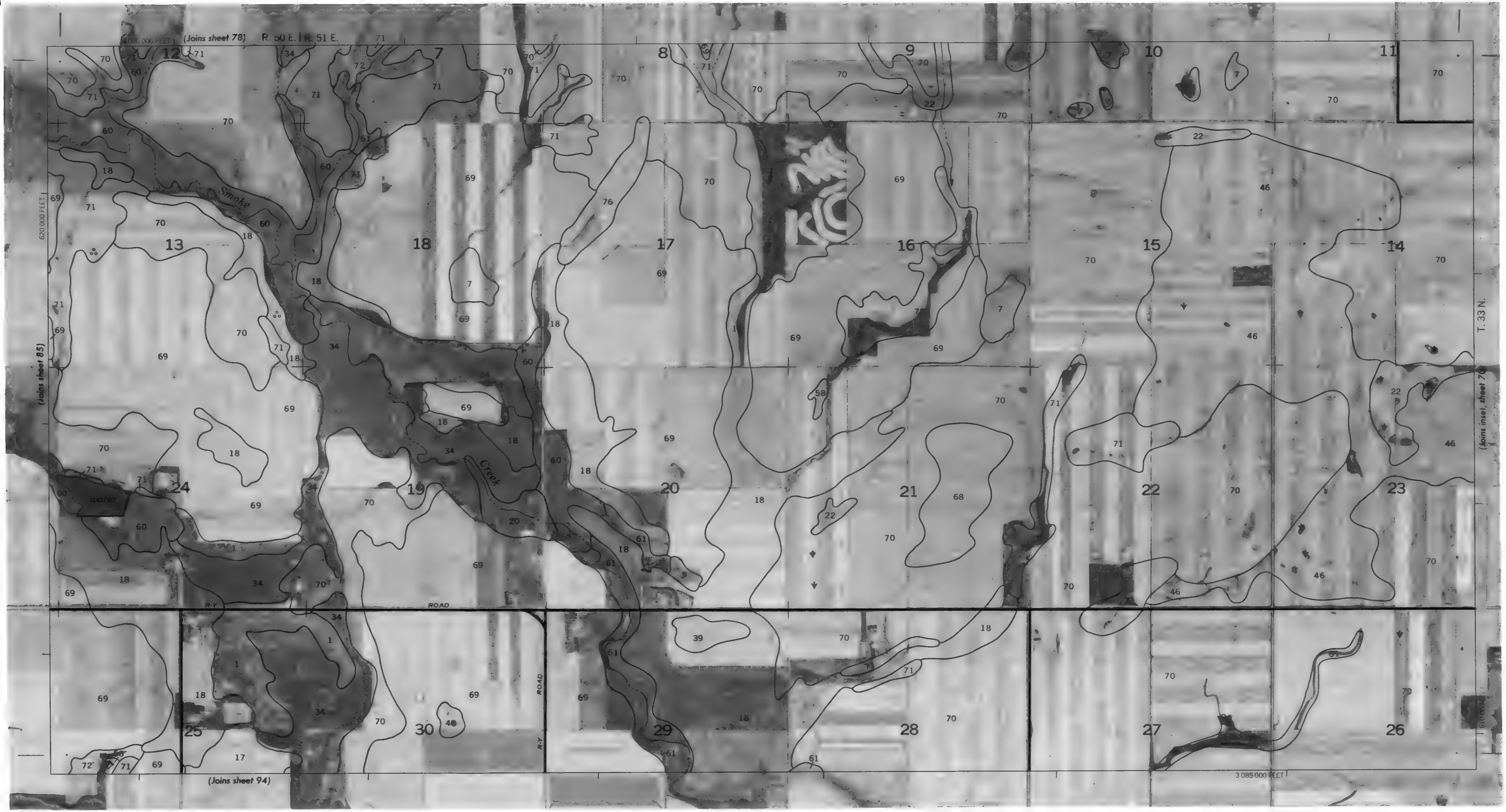
Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 85

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 86

N



1 ¾ ½ ¼ 0 1 2 Miles

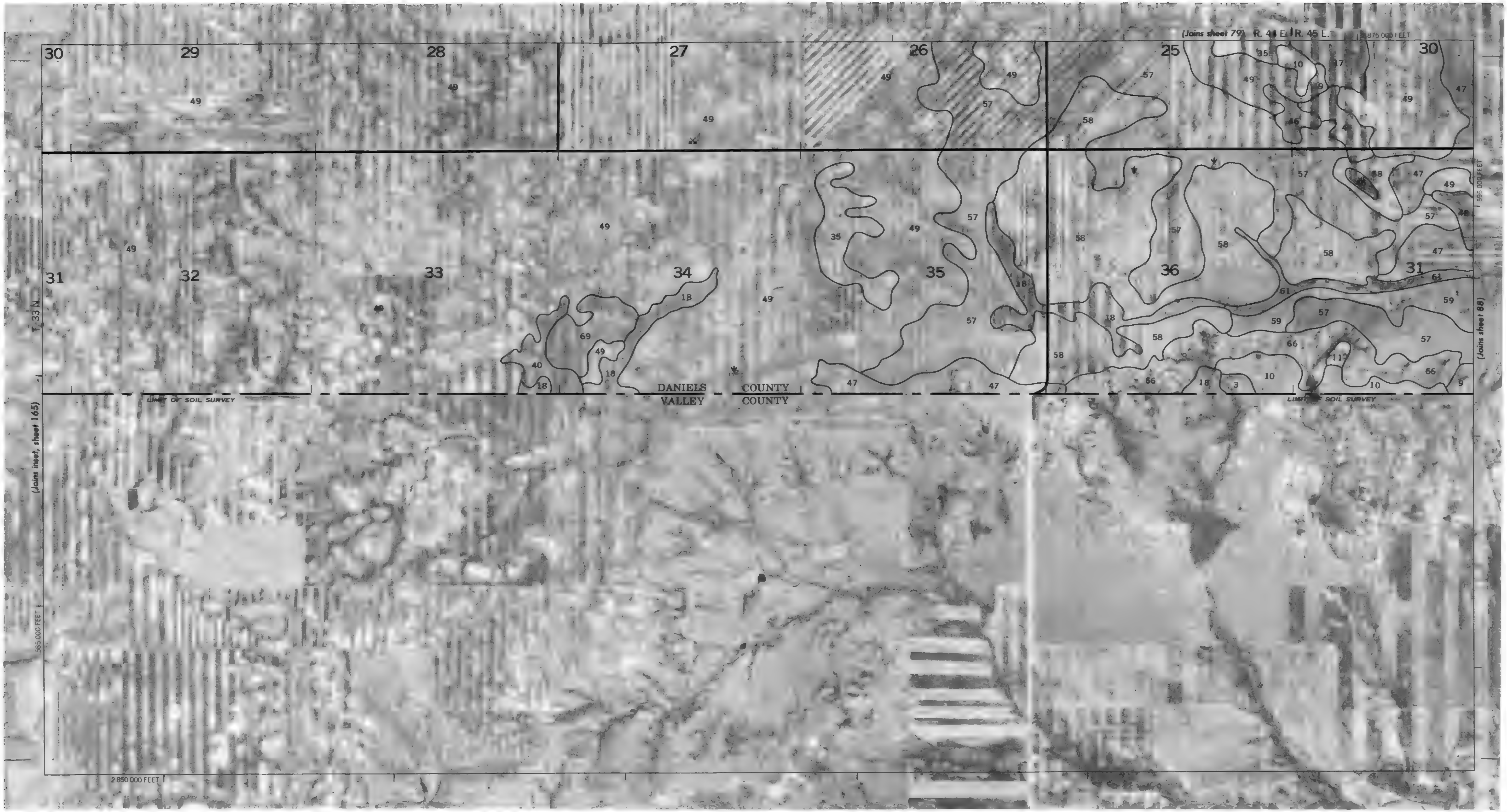
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N



1 ¾ ½ ¼ 0 1 2 Miles

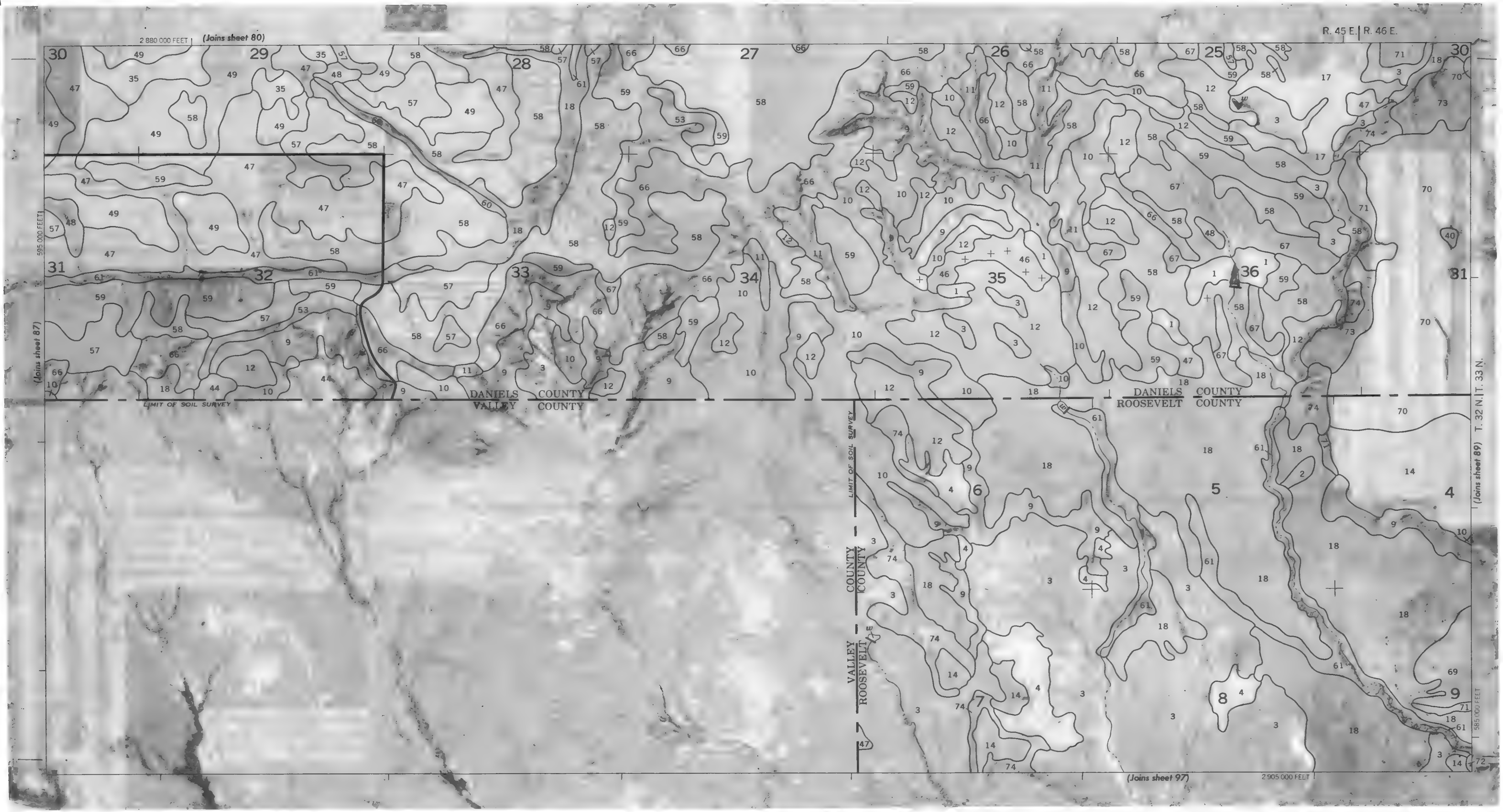
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 88

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

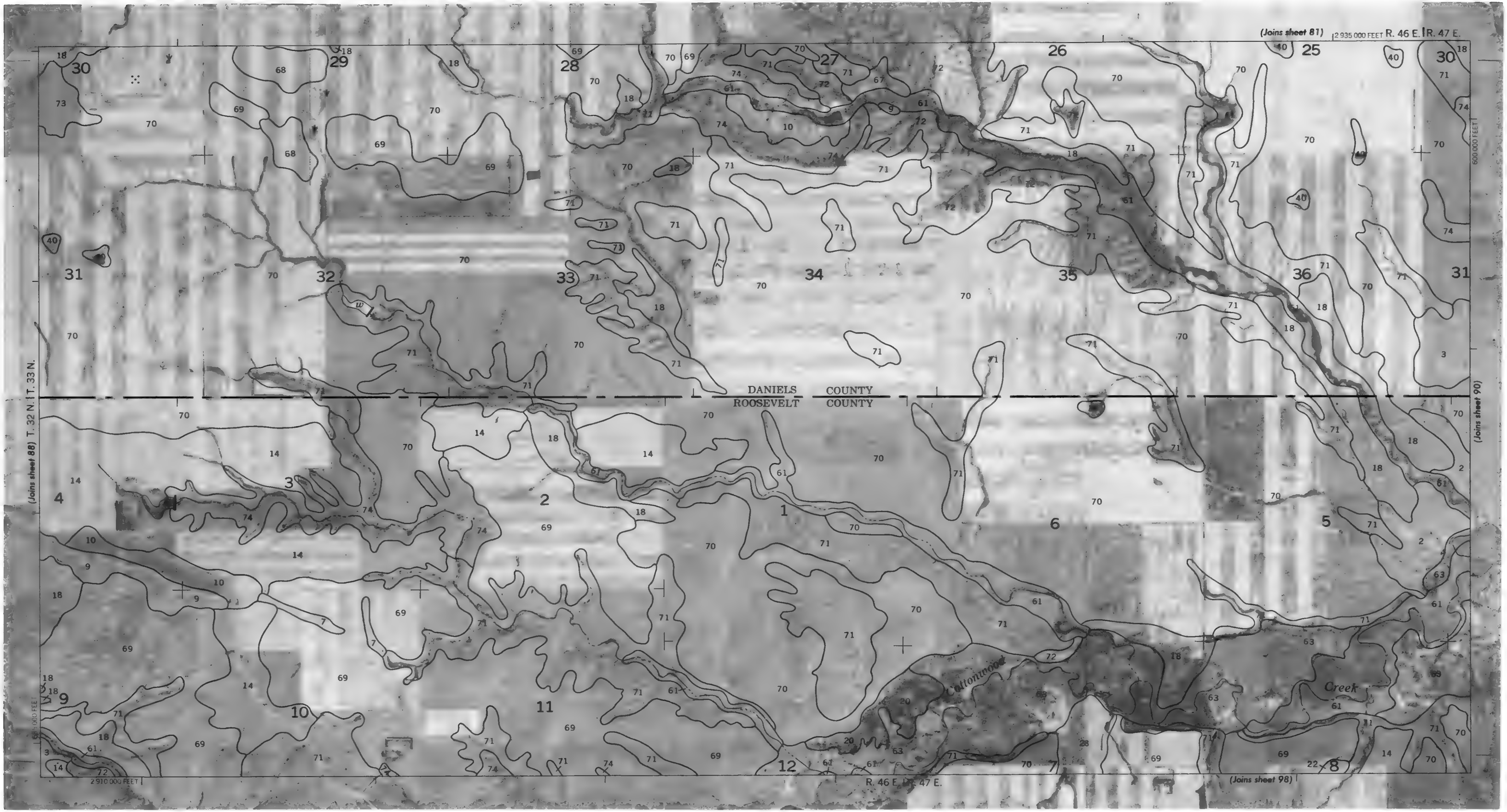
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 89

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

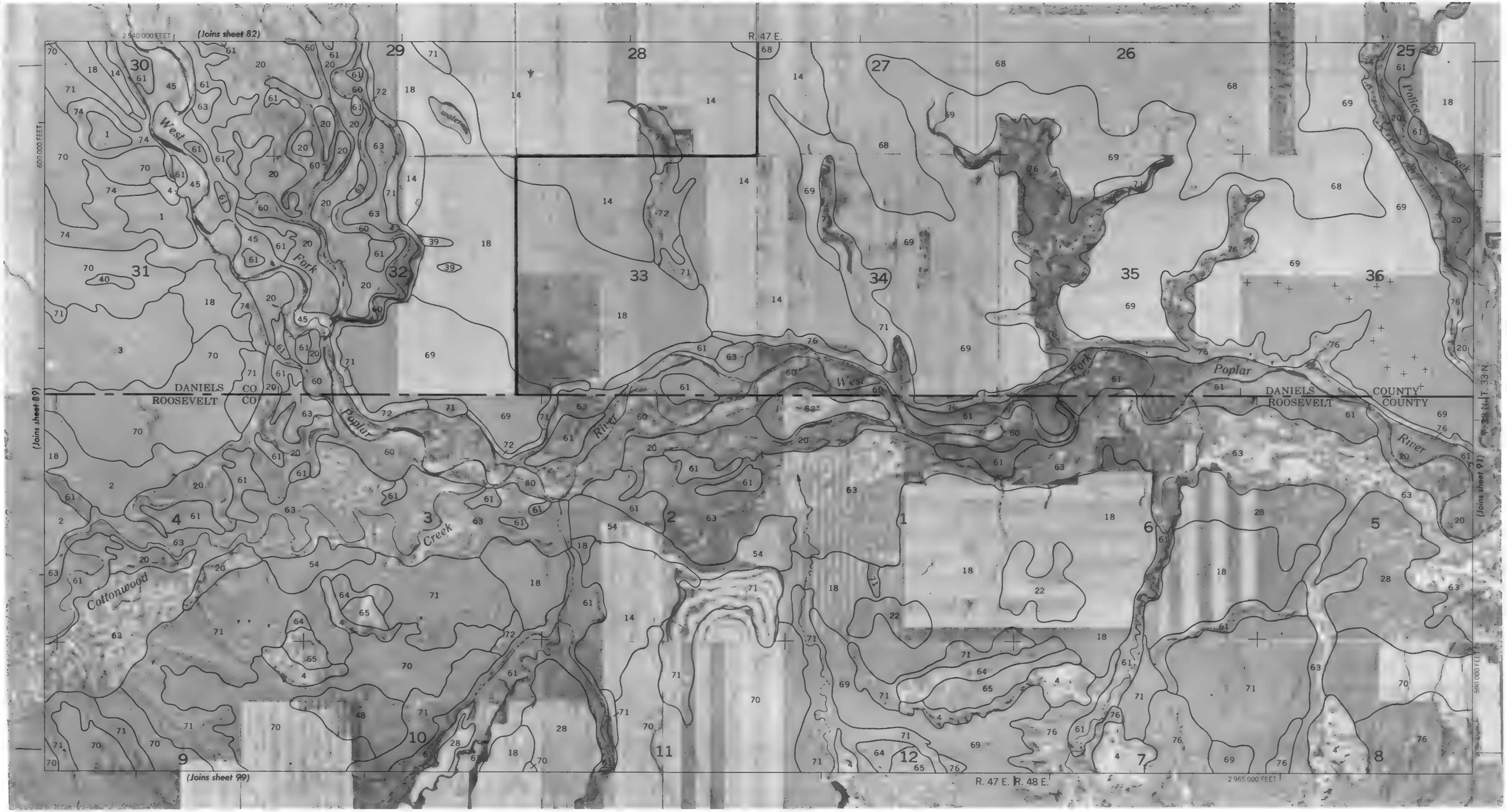


1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N



1 ¾ ½ ¼ 0 1 2 Miles

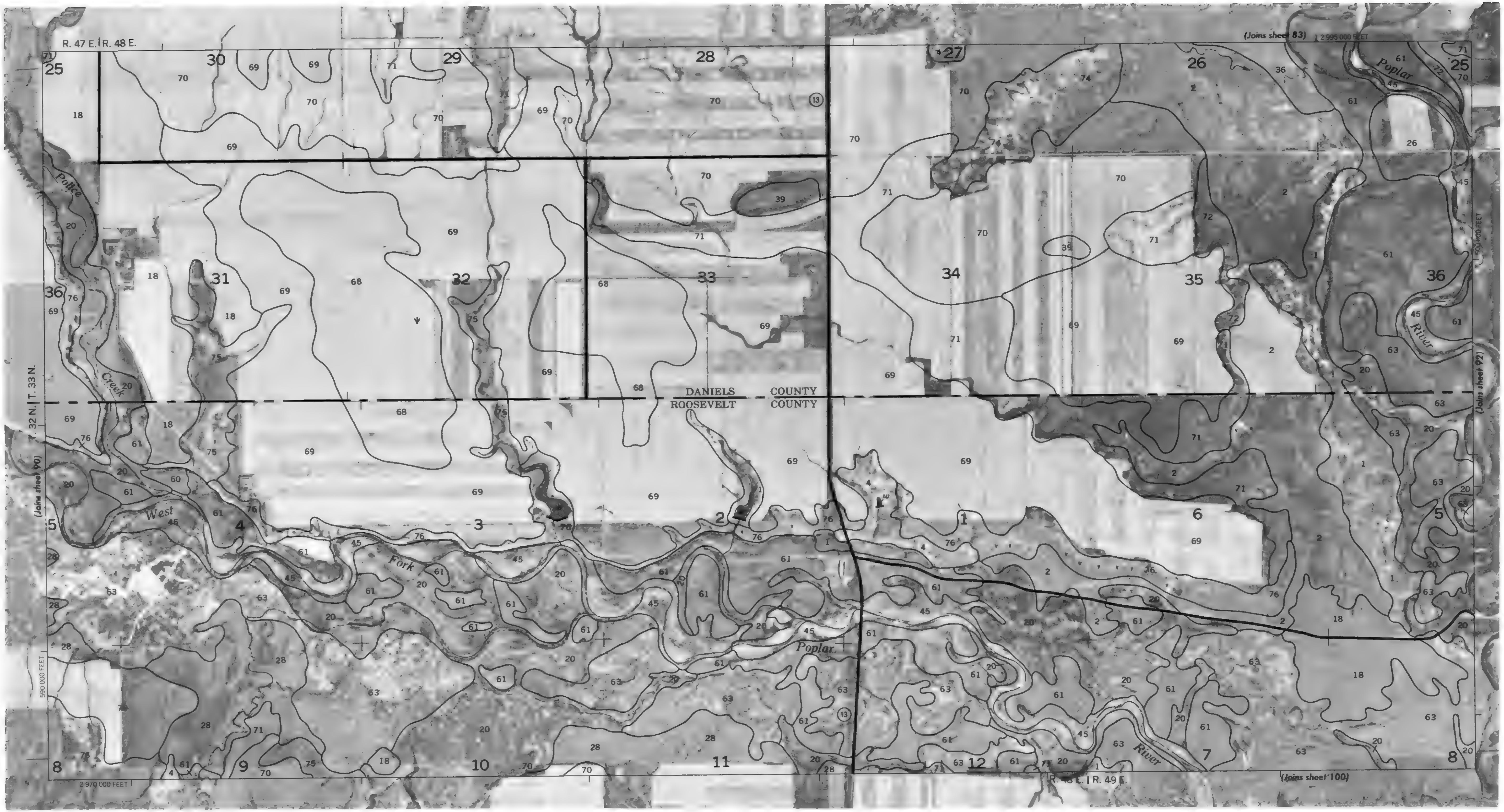
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N



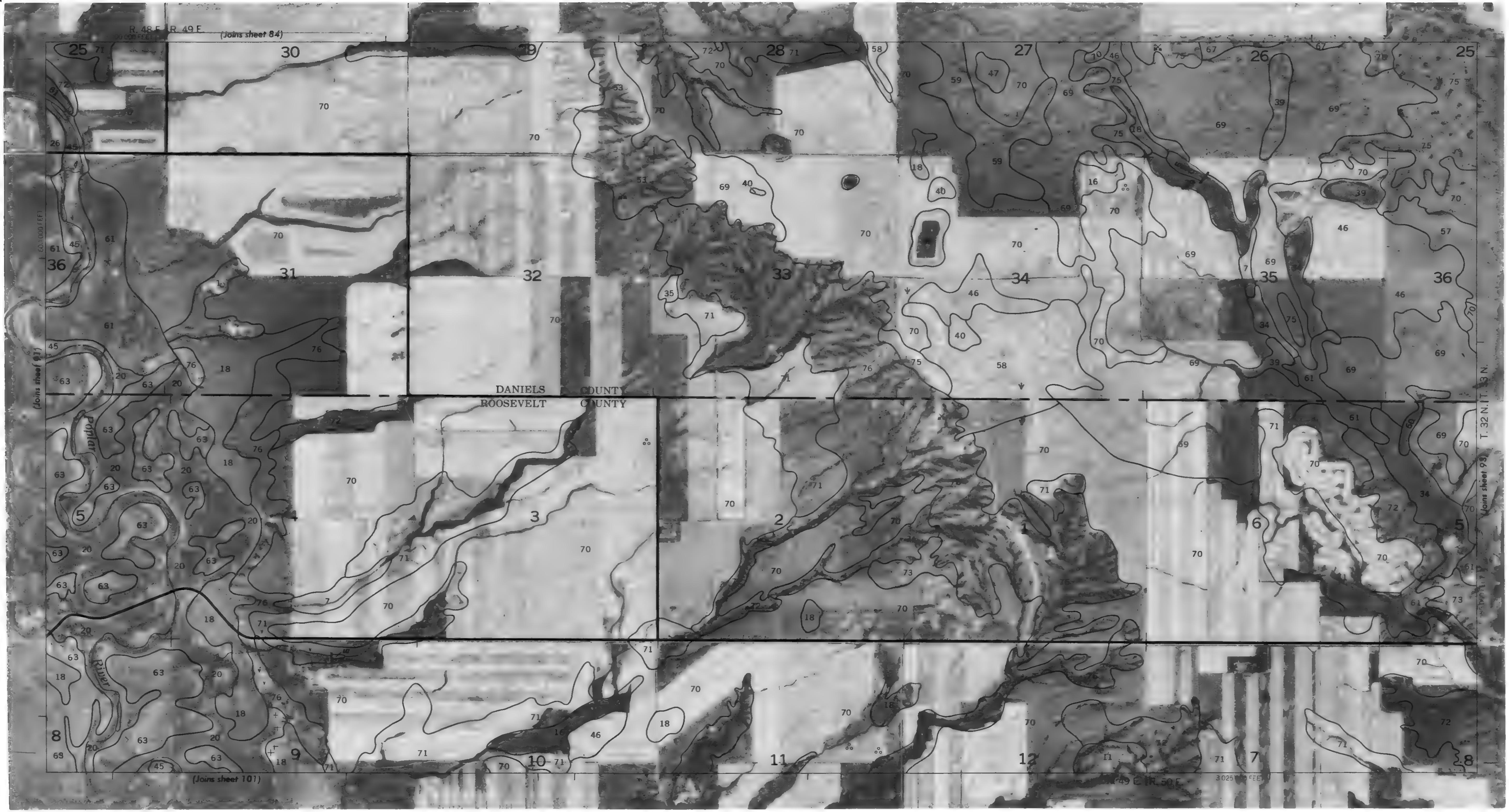
1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 91

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

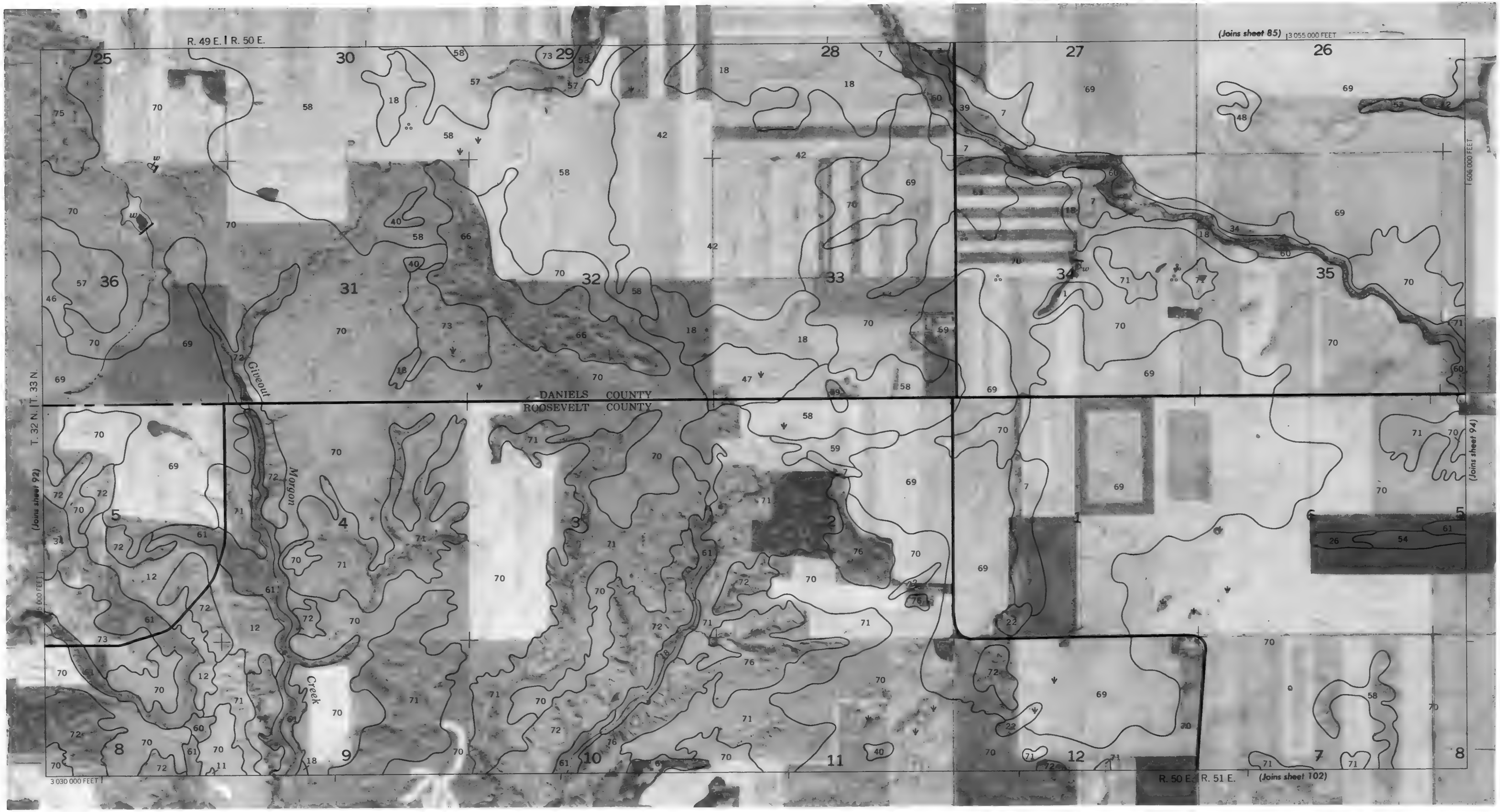
Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 92

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

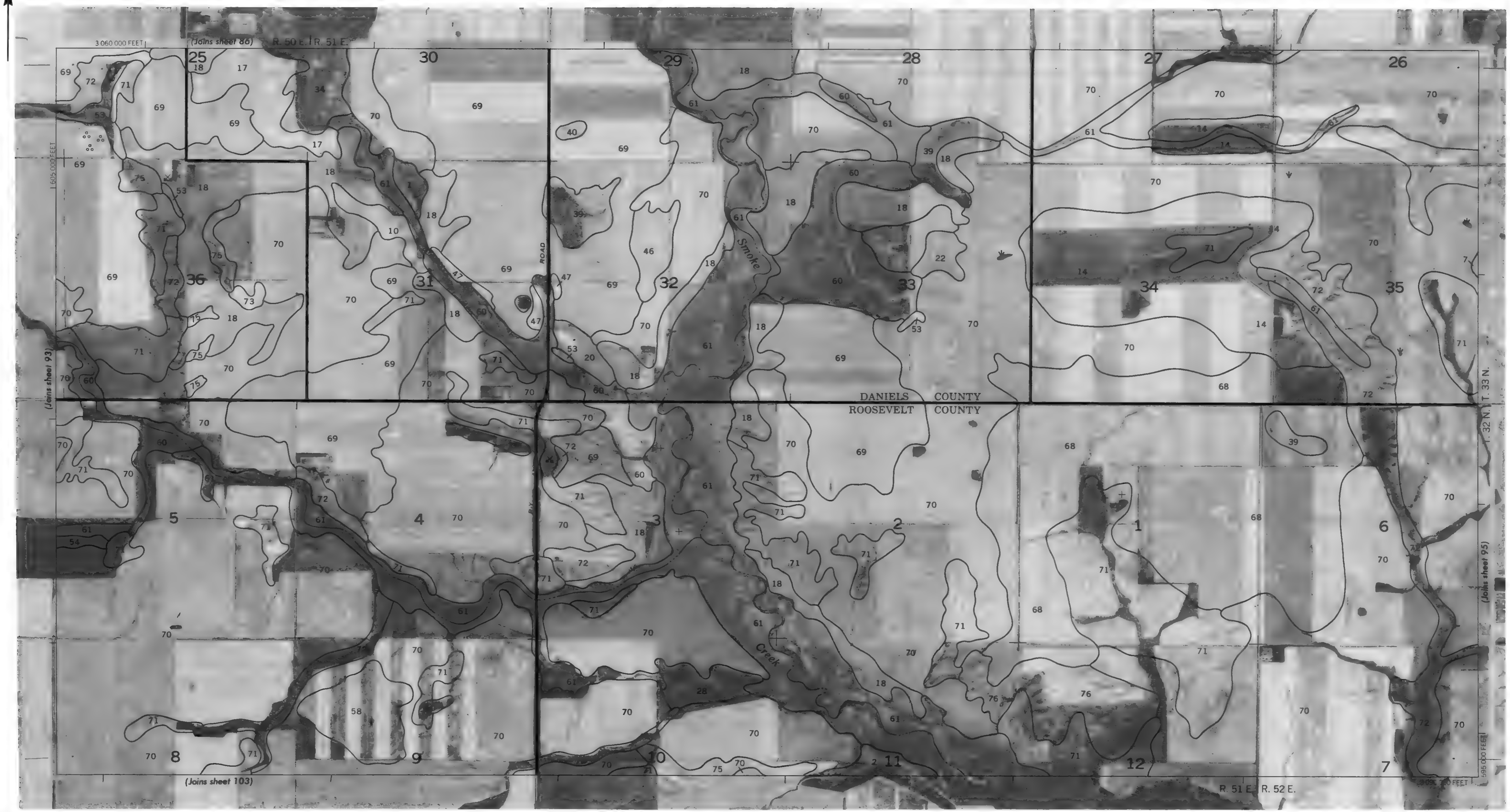
Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 93

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 94



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 94

N

1 ¾ ½ ¼ 0 1 2 Miles

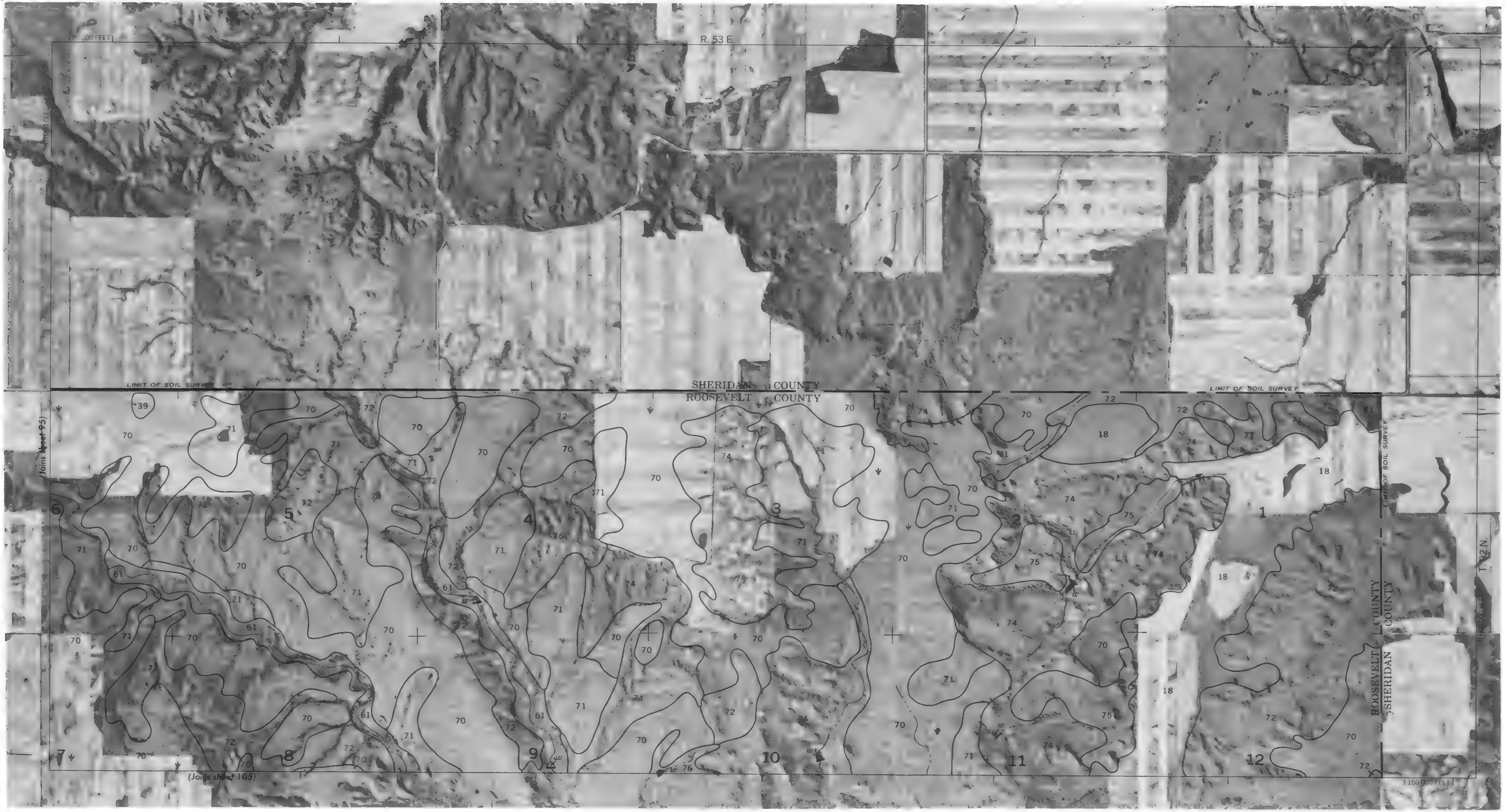
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 95

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N



1 ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

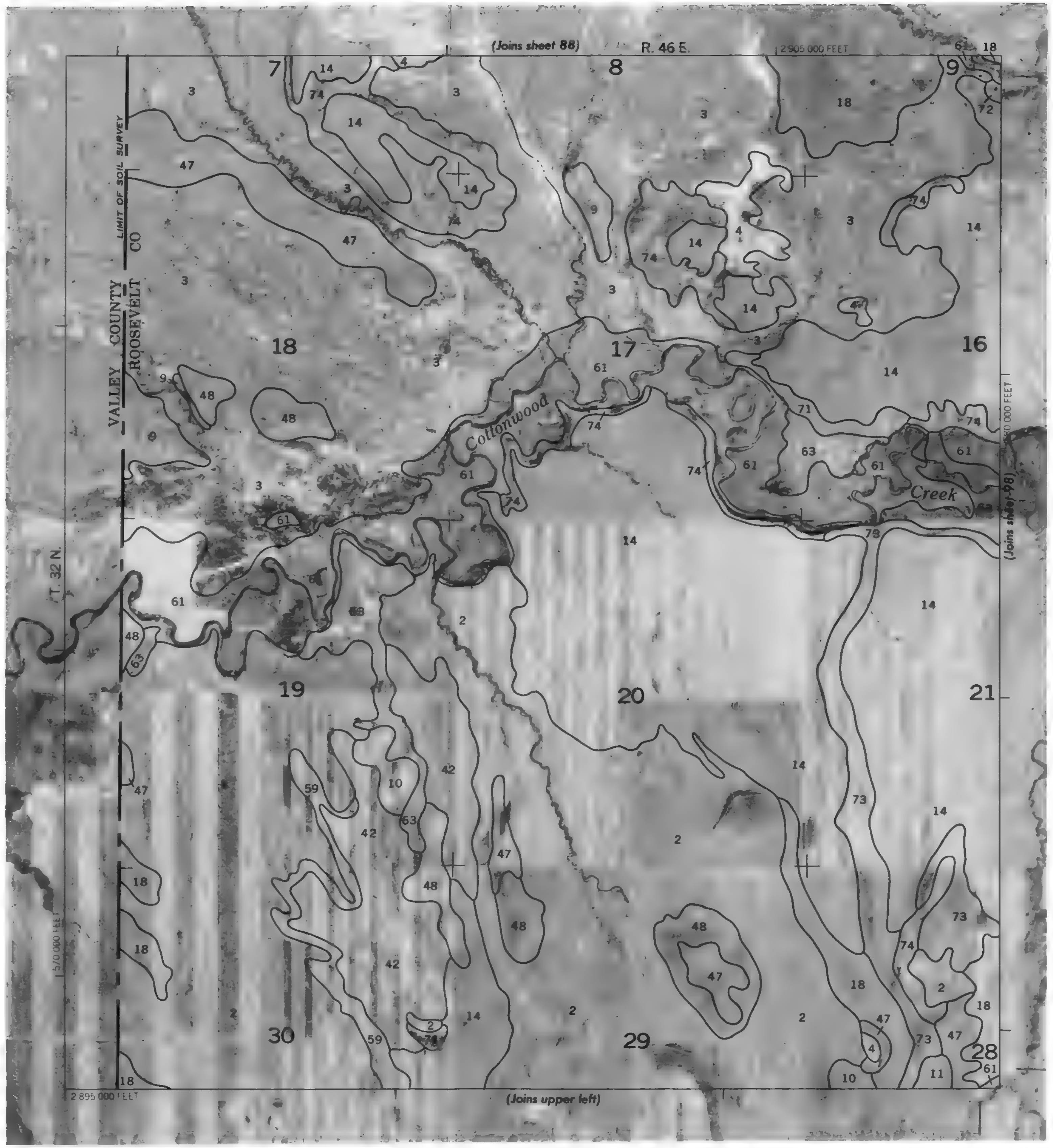
Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 97

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

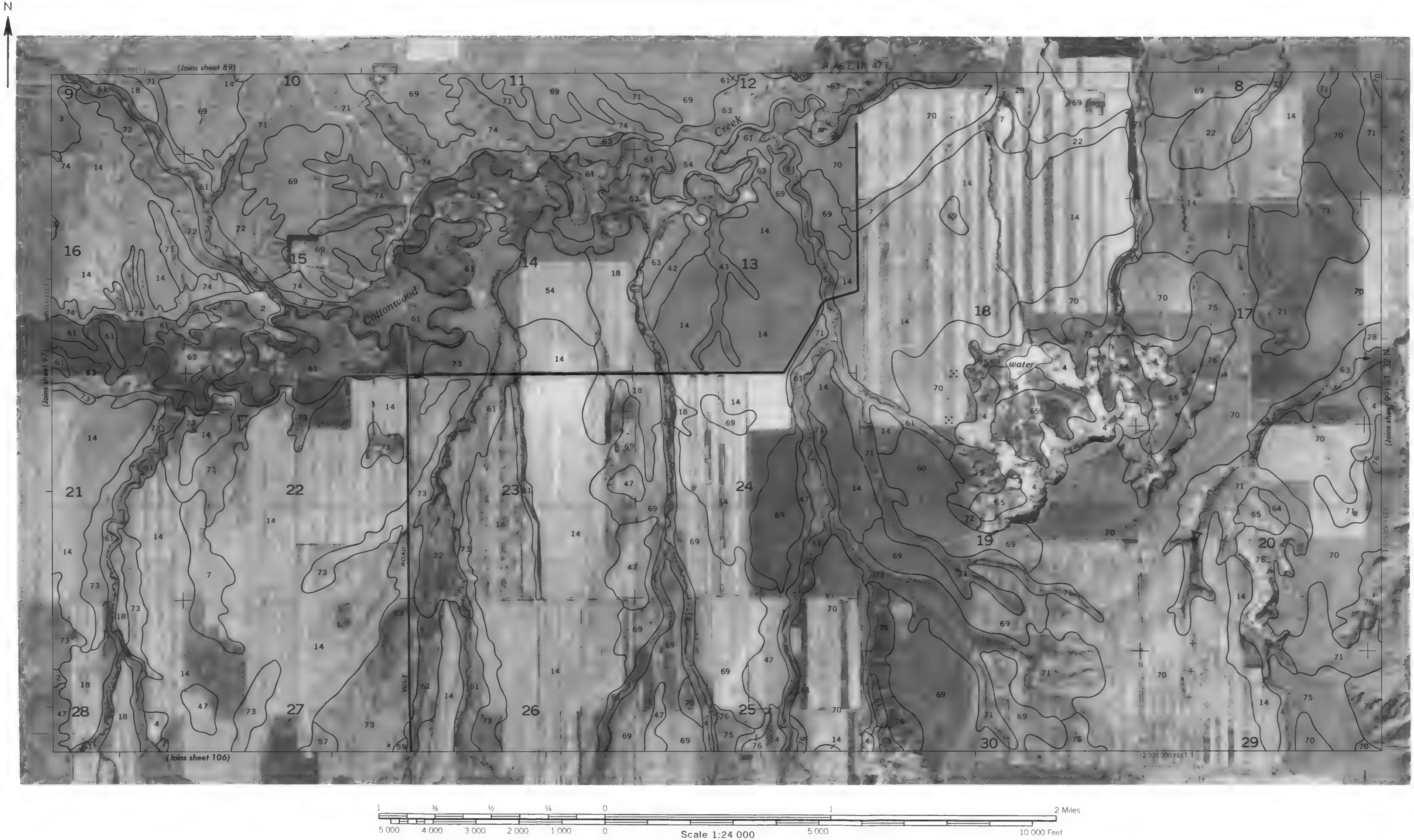


1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

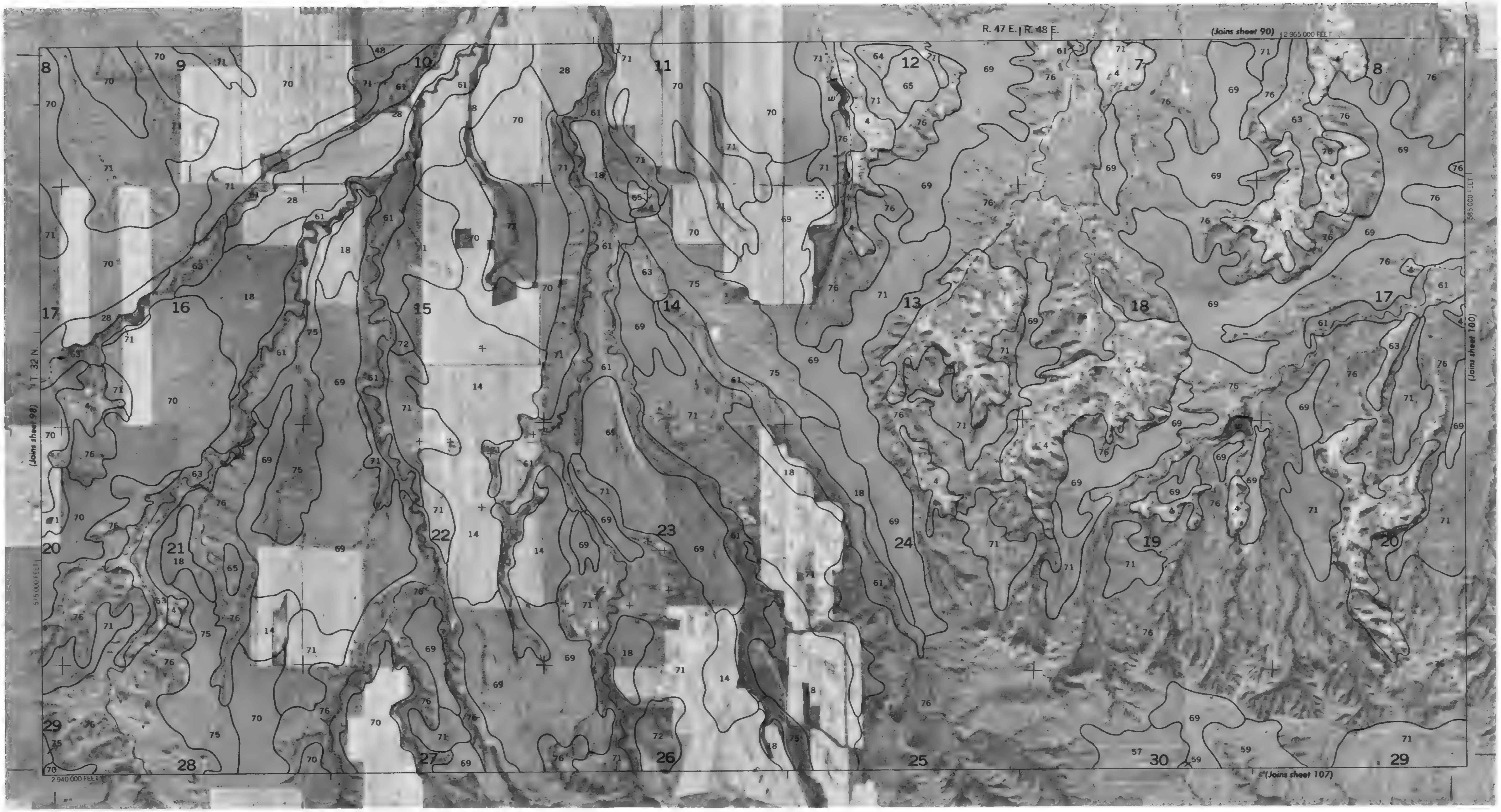
ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 98



Coordinate grid ticks and land division corners, if shown, are approximately positioned

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

N



1 ¾ ½ ¼ 0 1 2 Miles

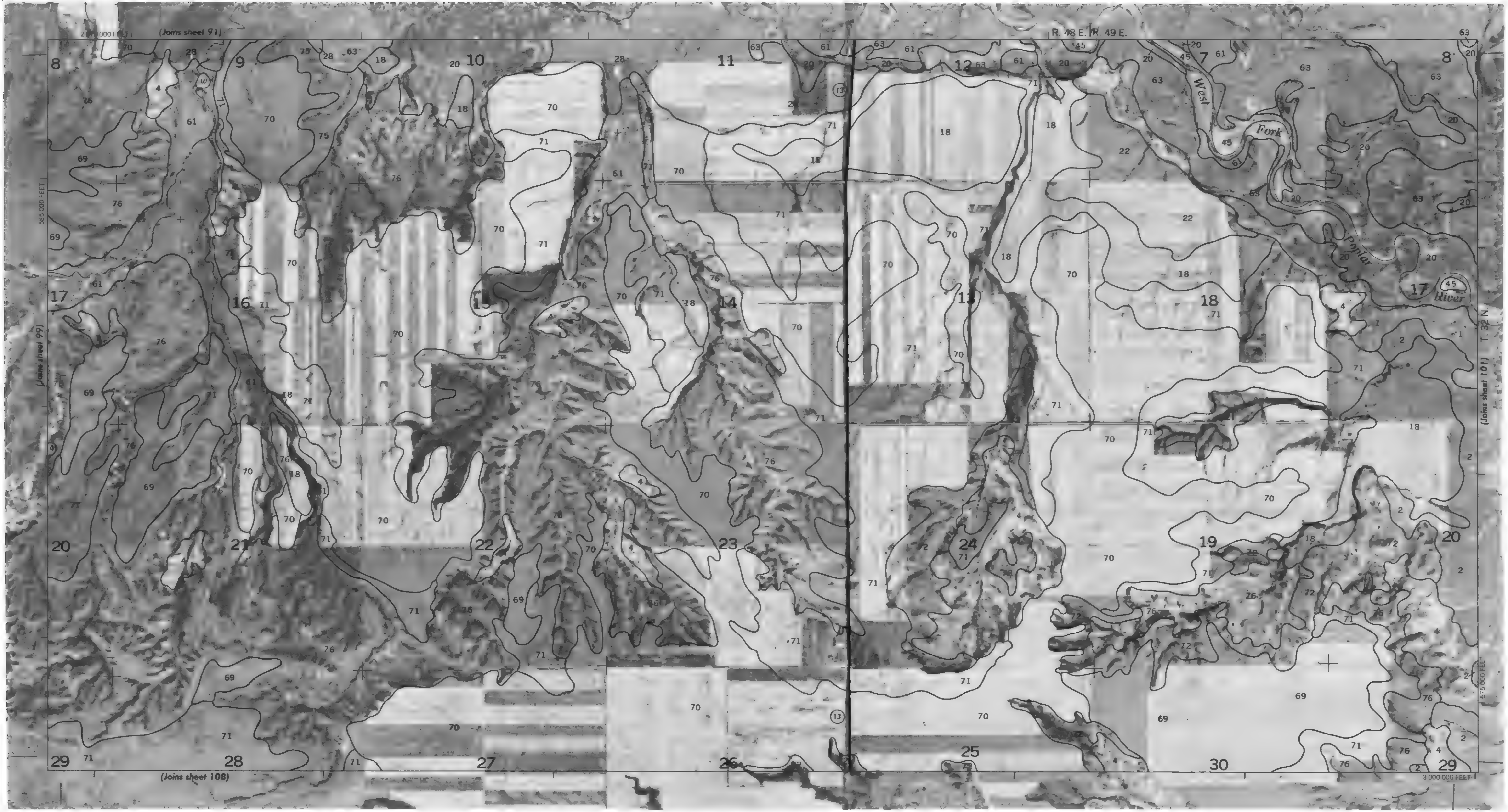
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 100

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 100

N

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N

1 ¾ ½ ¼ 0 1 2 Miles

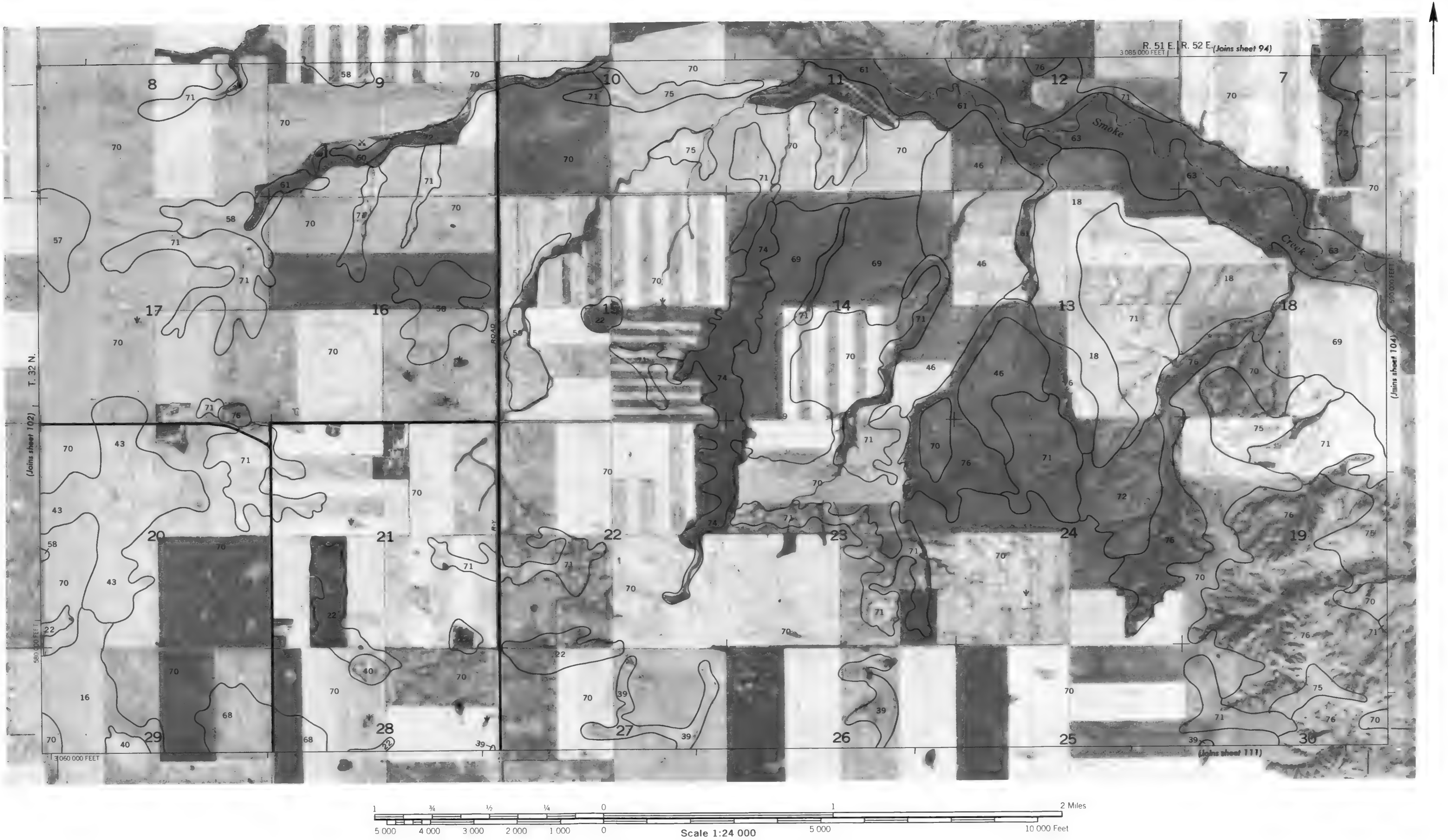
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 102



ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 103

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 104

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 104

105

N

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

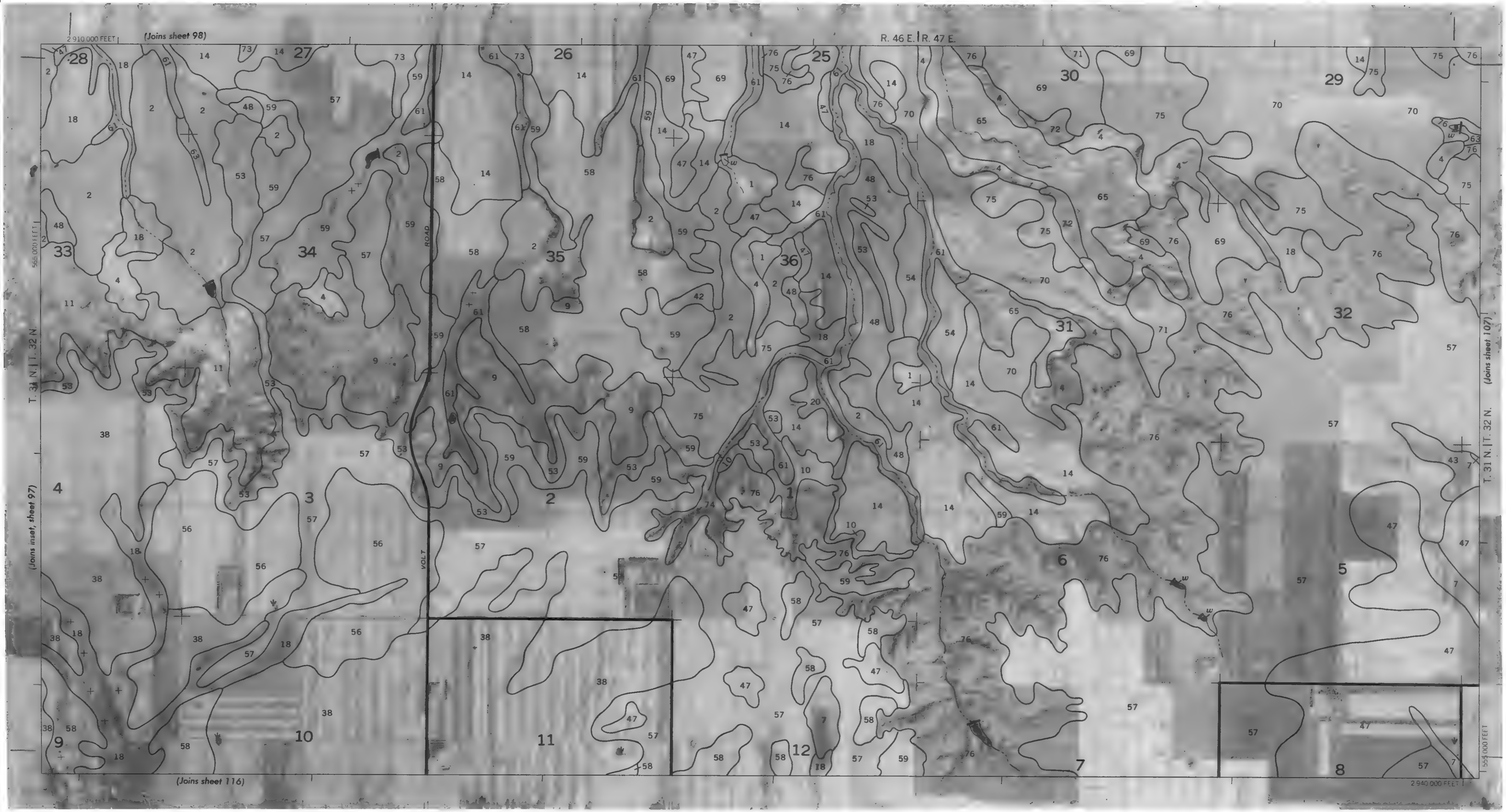
1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 106

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

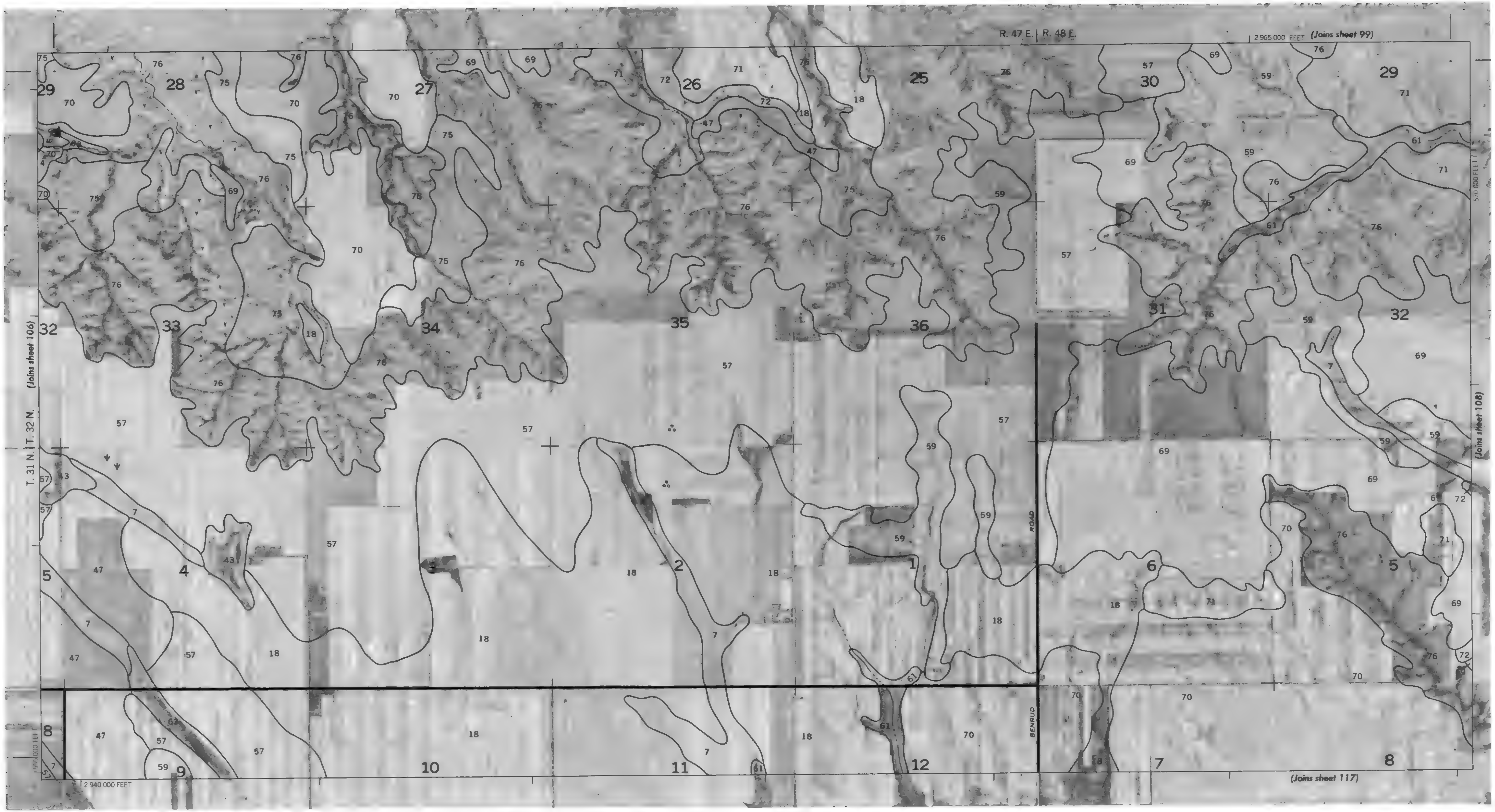
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 106

107

N



1 ¾ ½ ¼ 0 1 2 Miles

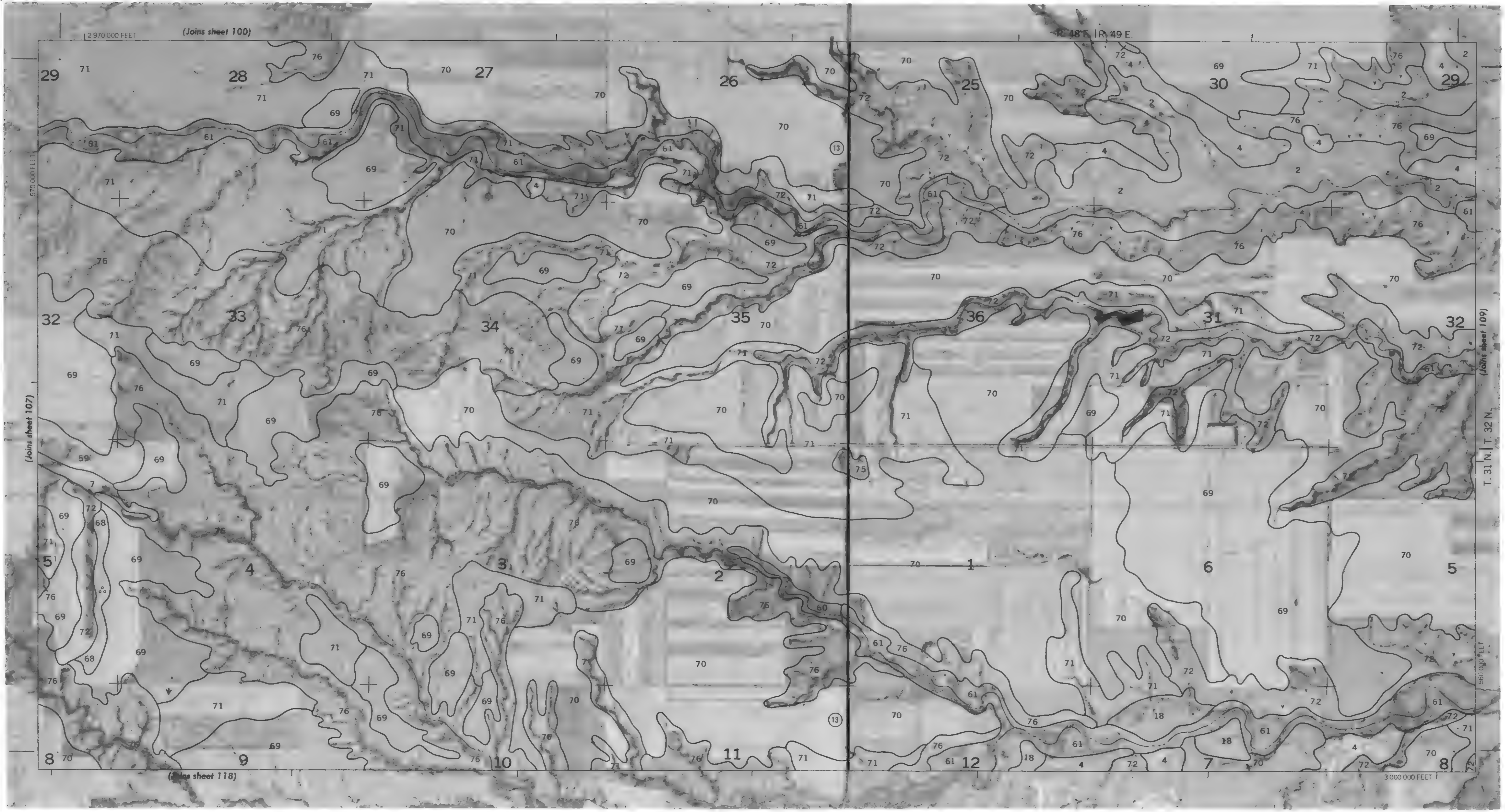
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 108



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

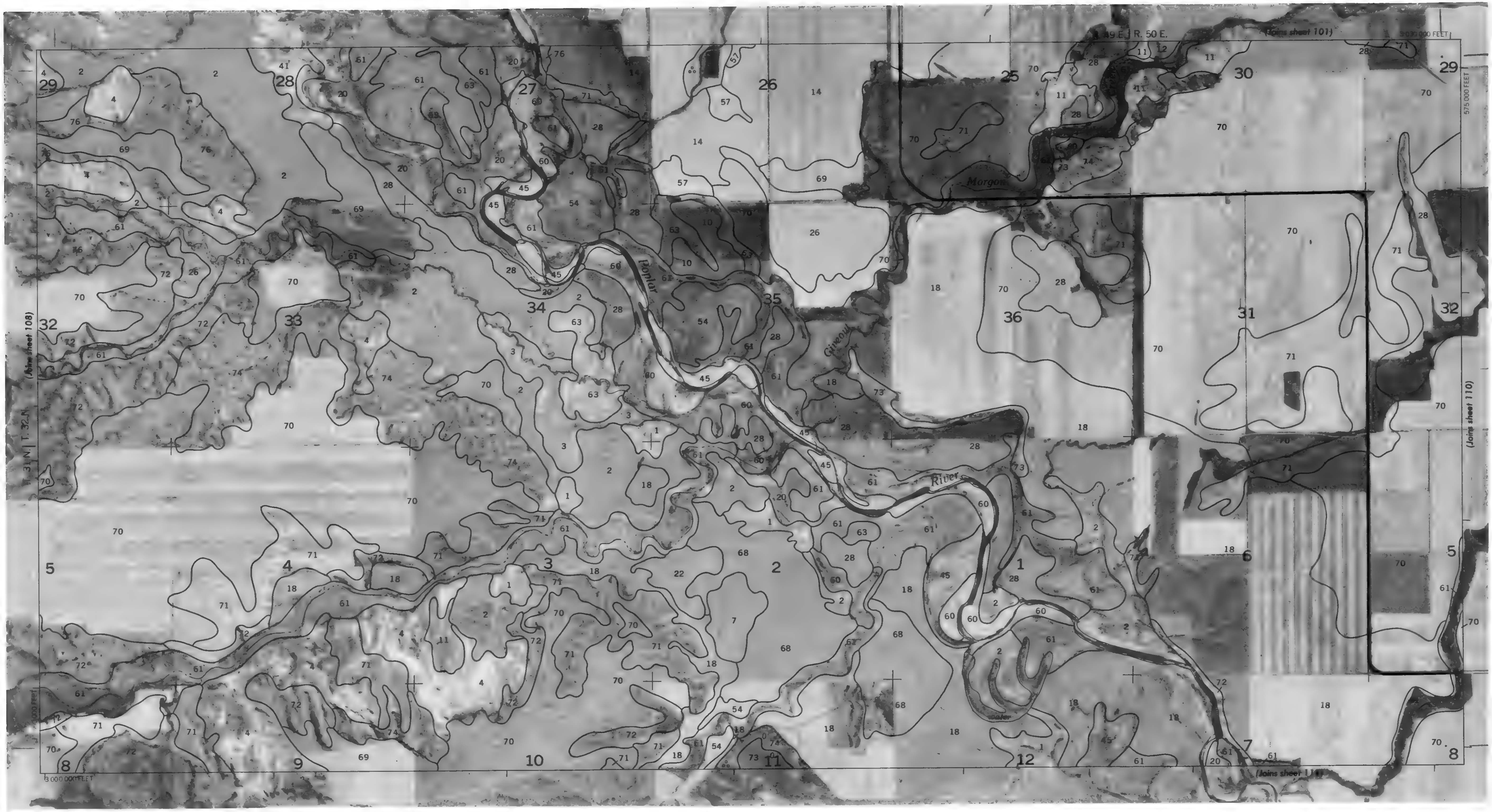
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 108

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 109

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



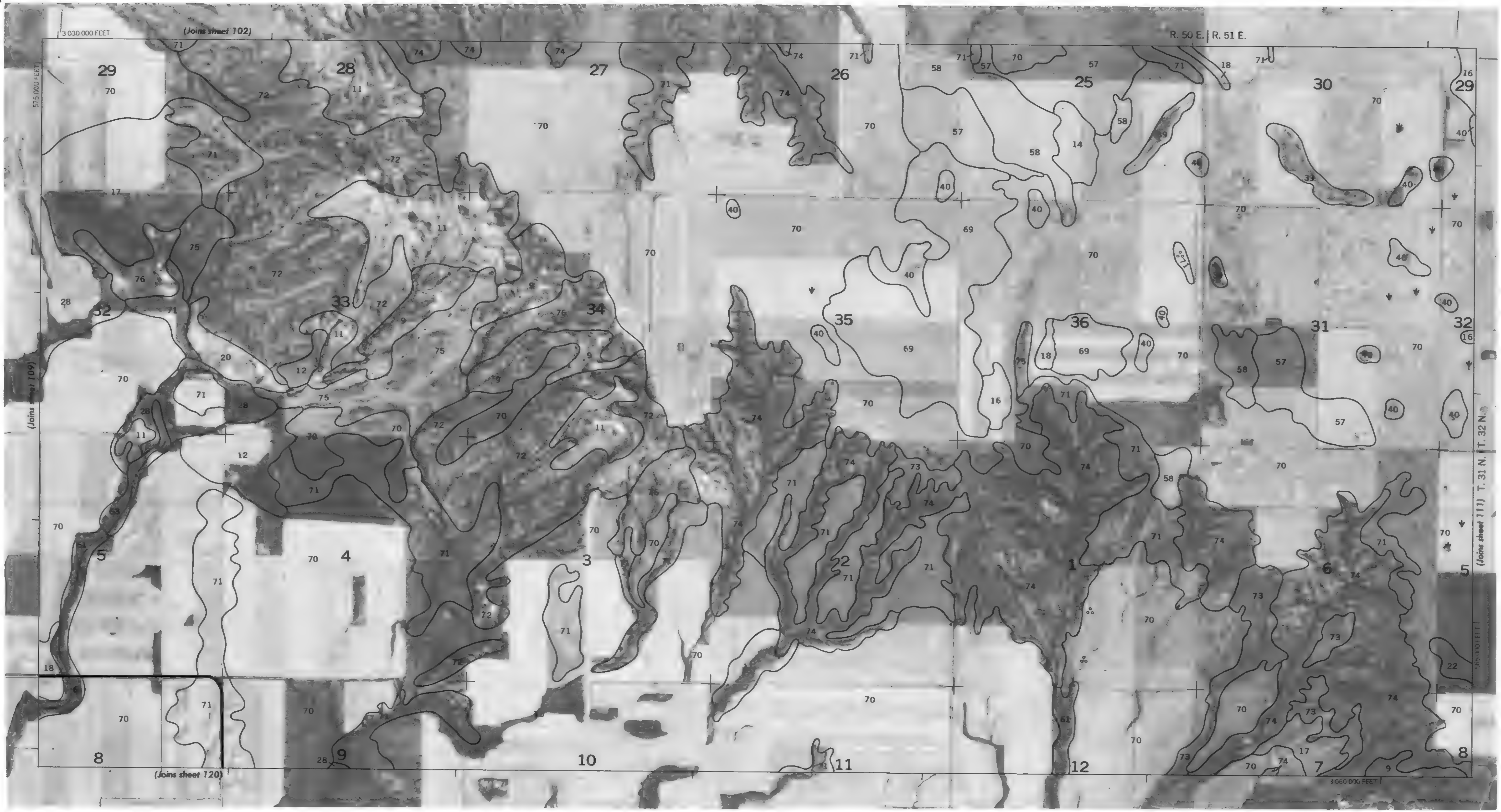
1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 110



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

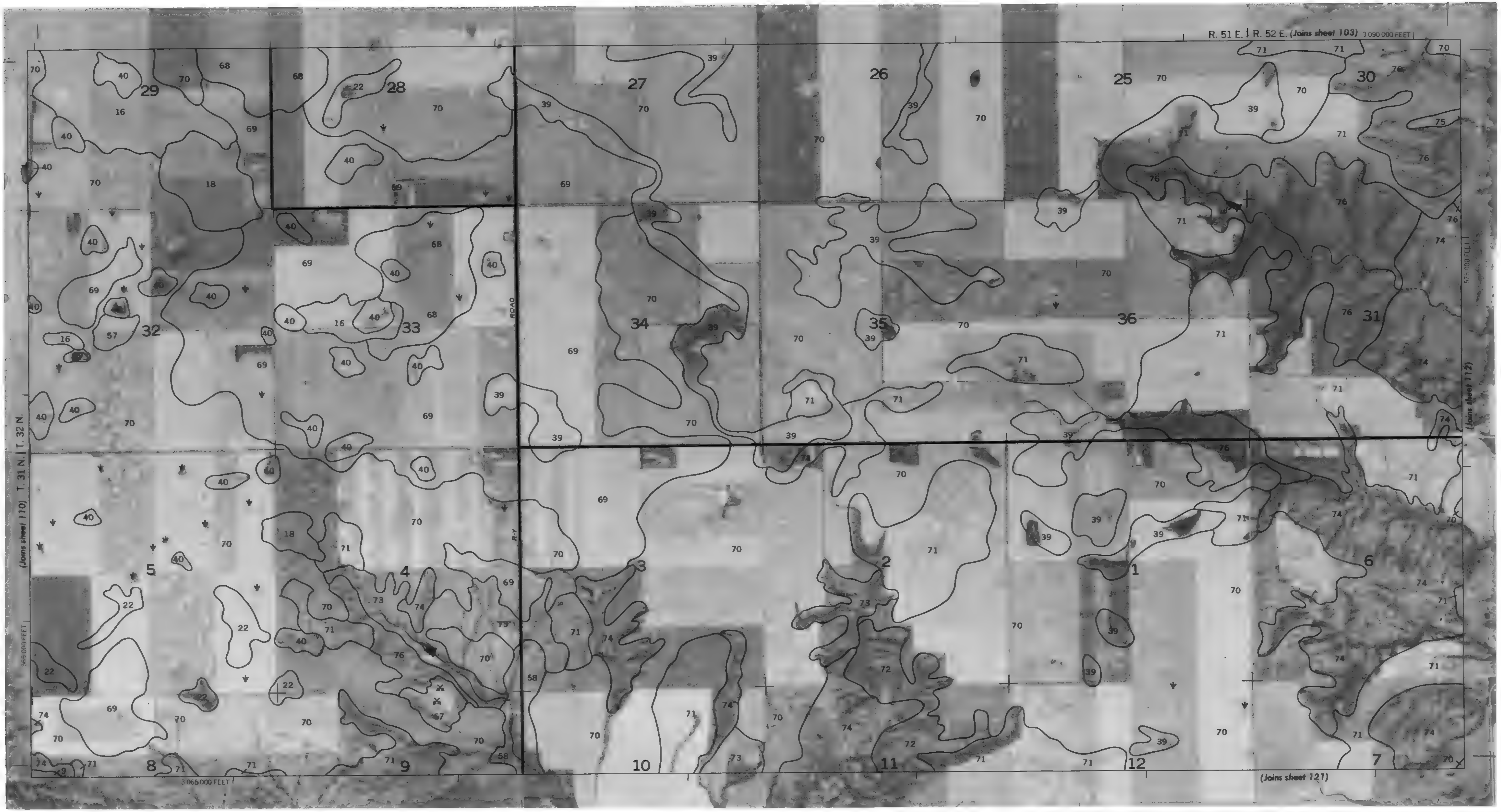
Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 110

111

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

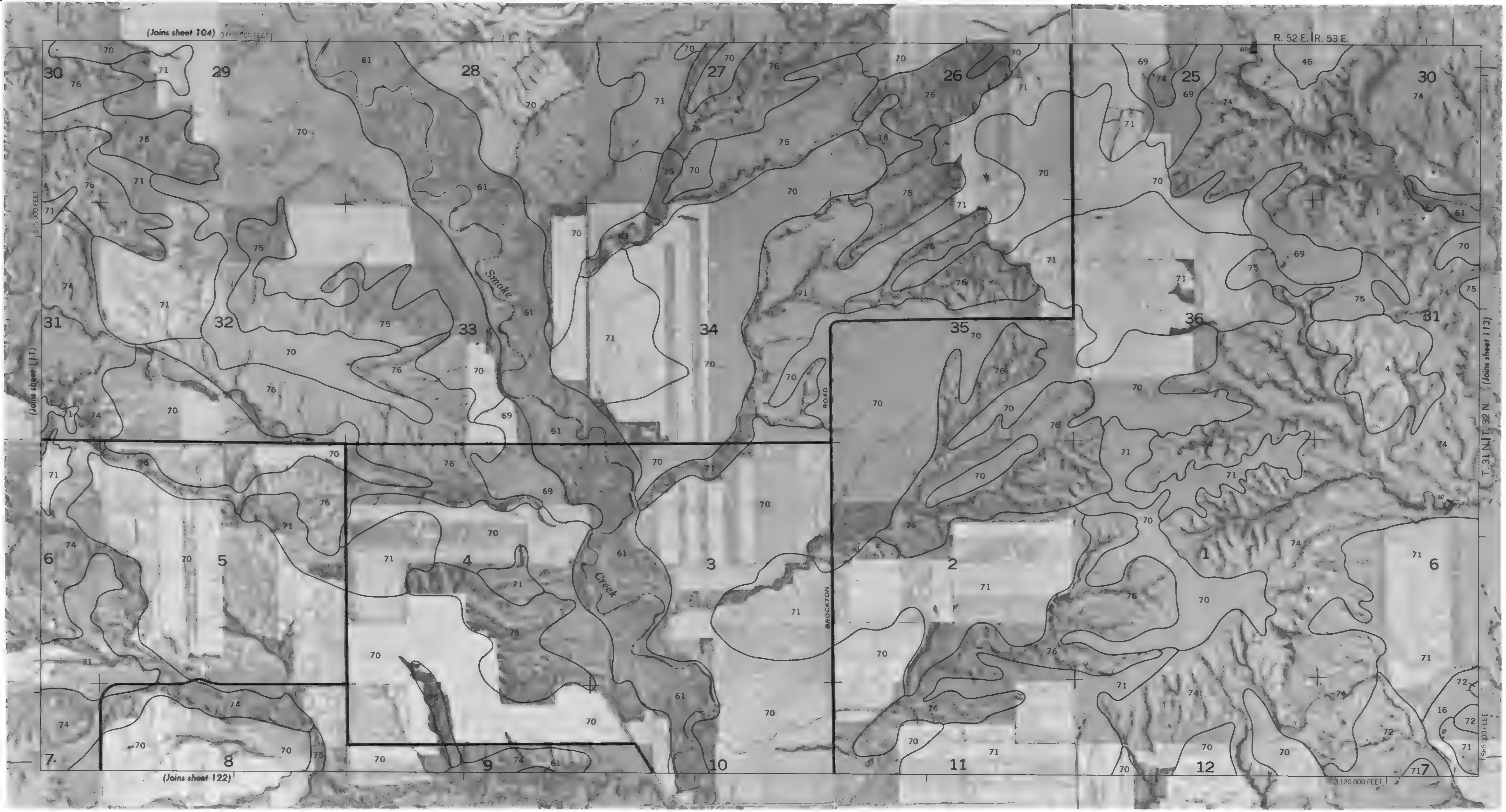
Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 111

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(112)

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 112

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 113

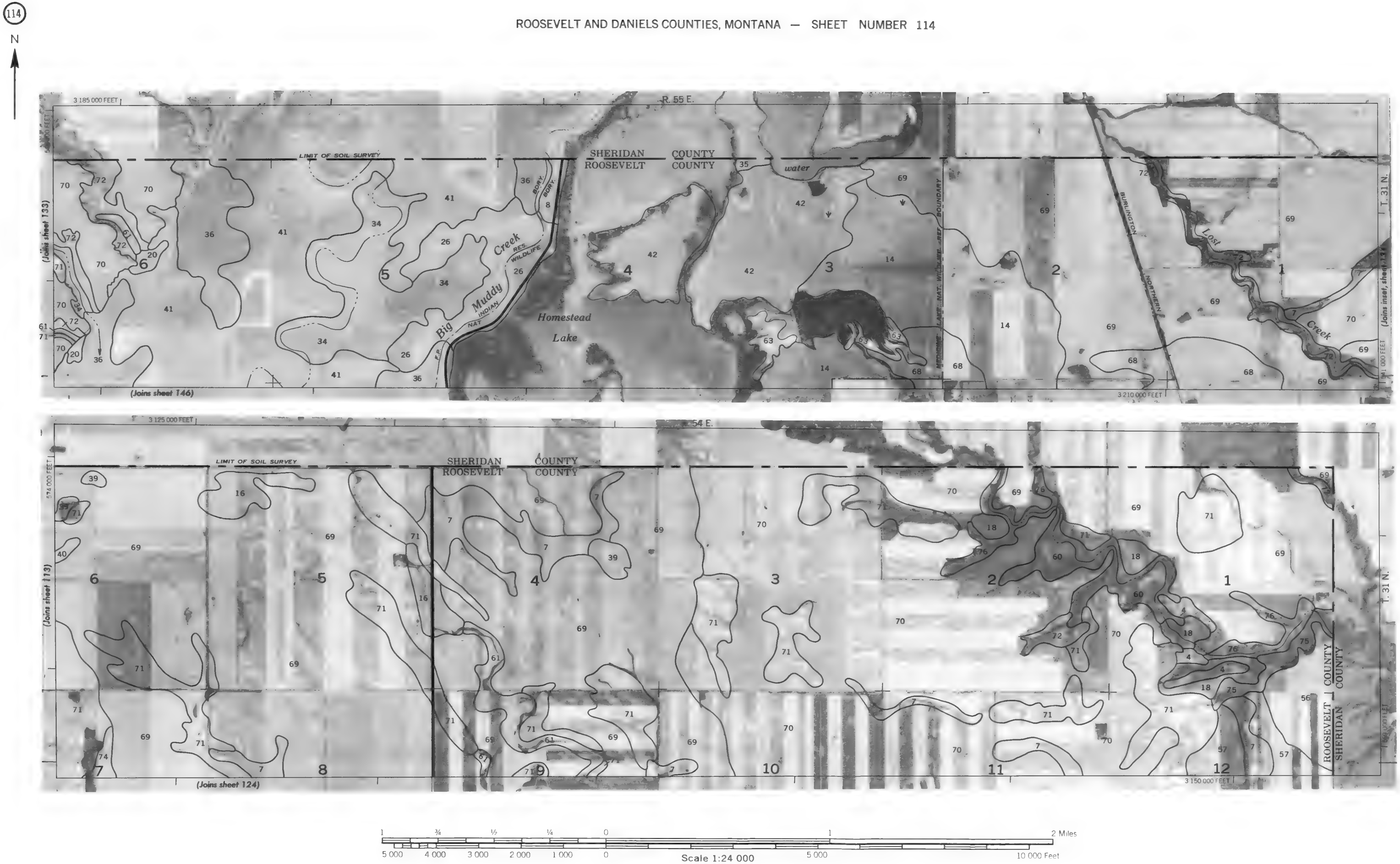
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 114



Coordinate grid ticks and land division corners, if shown, are approximately positioned

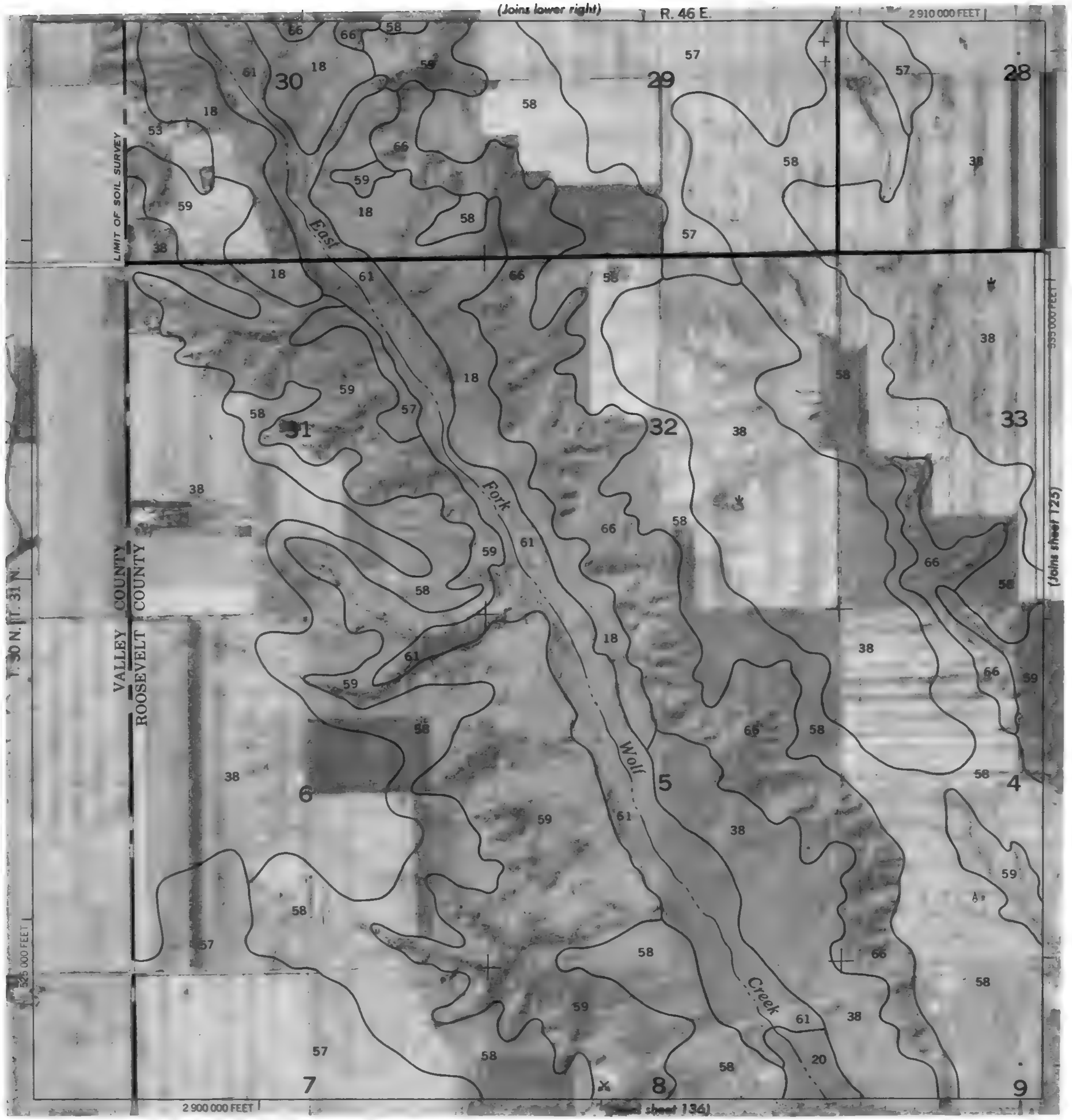
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

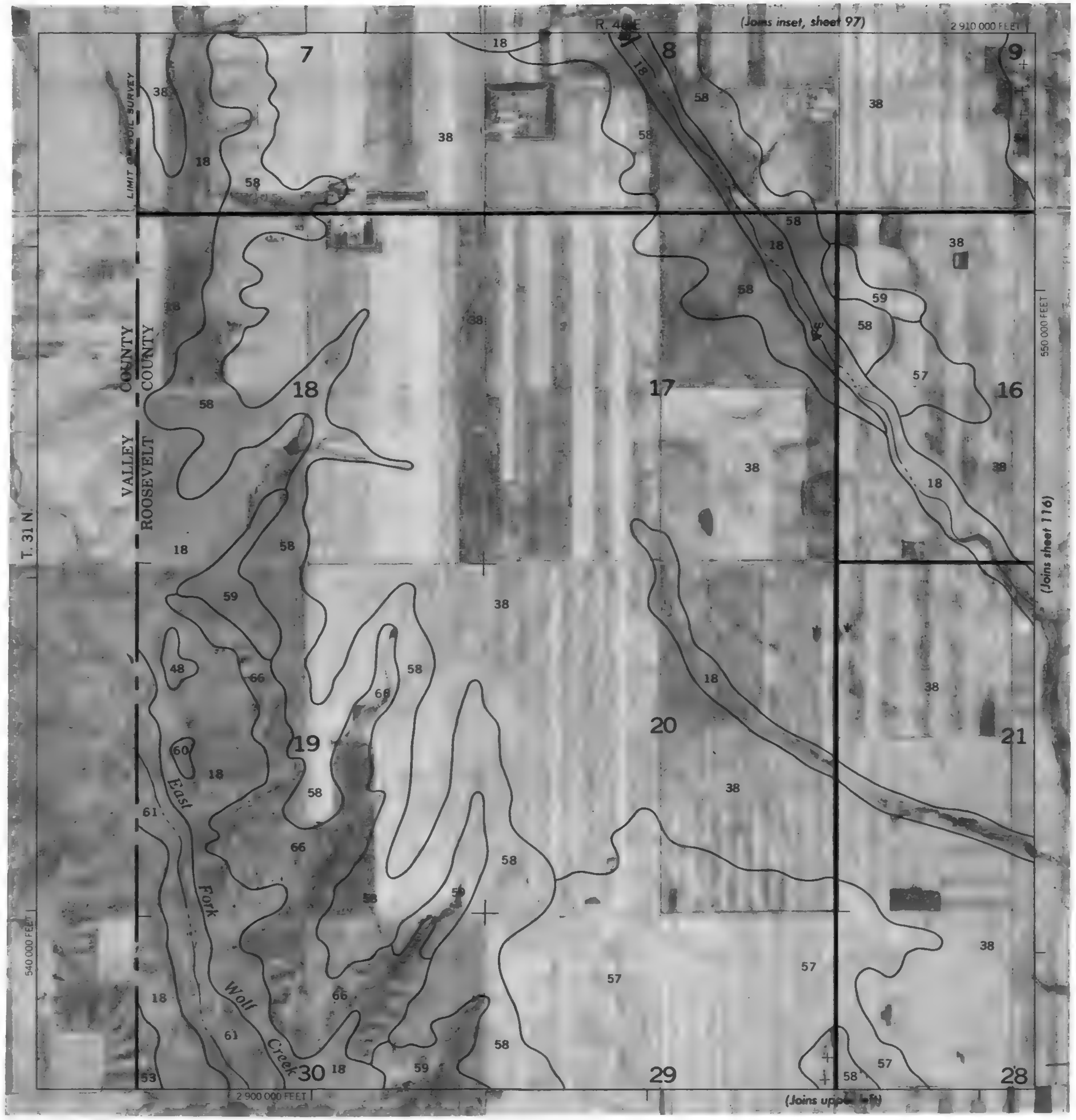
ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 114

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 115

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.





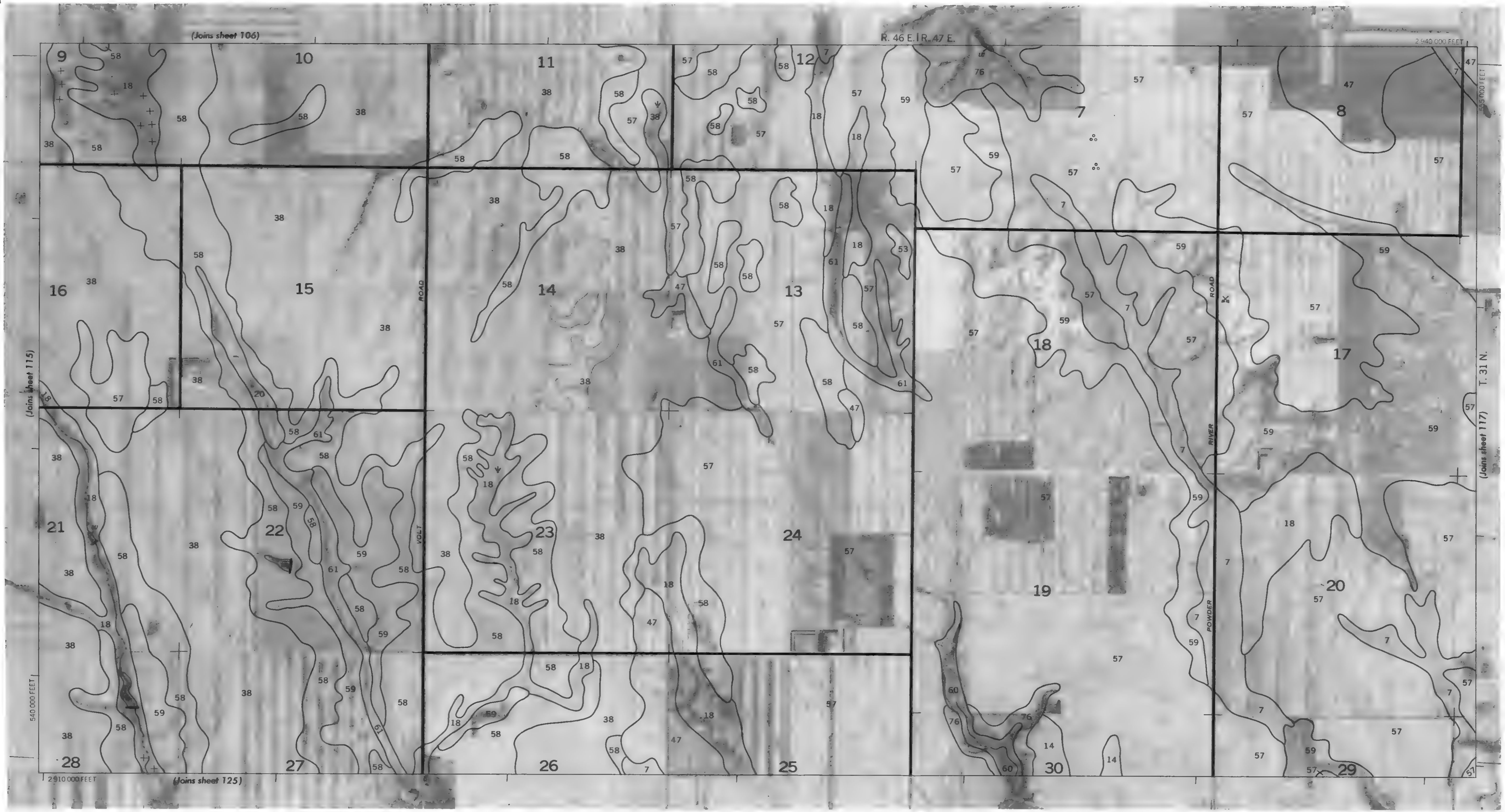
1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 116

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 116

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 117

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

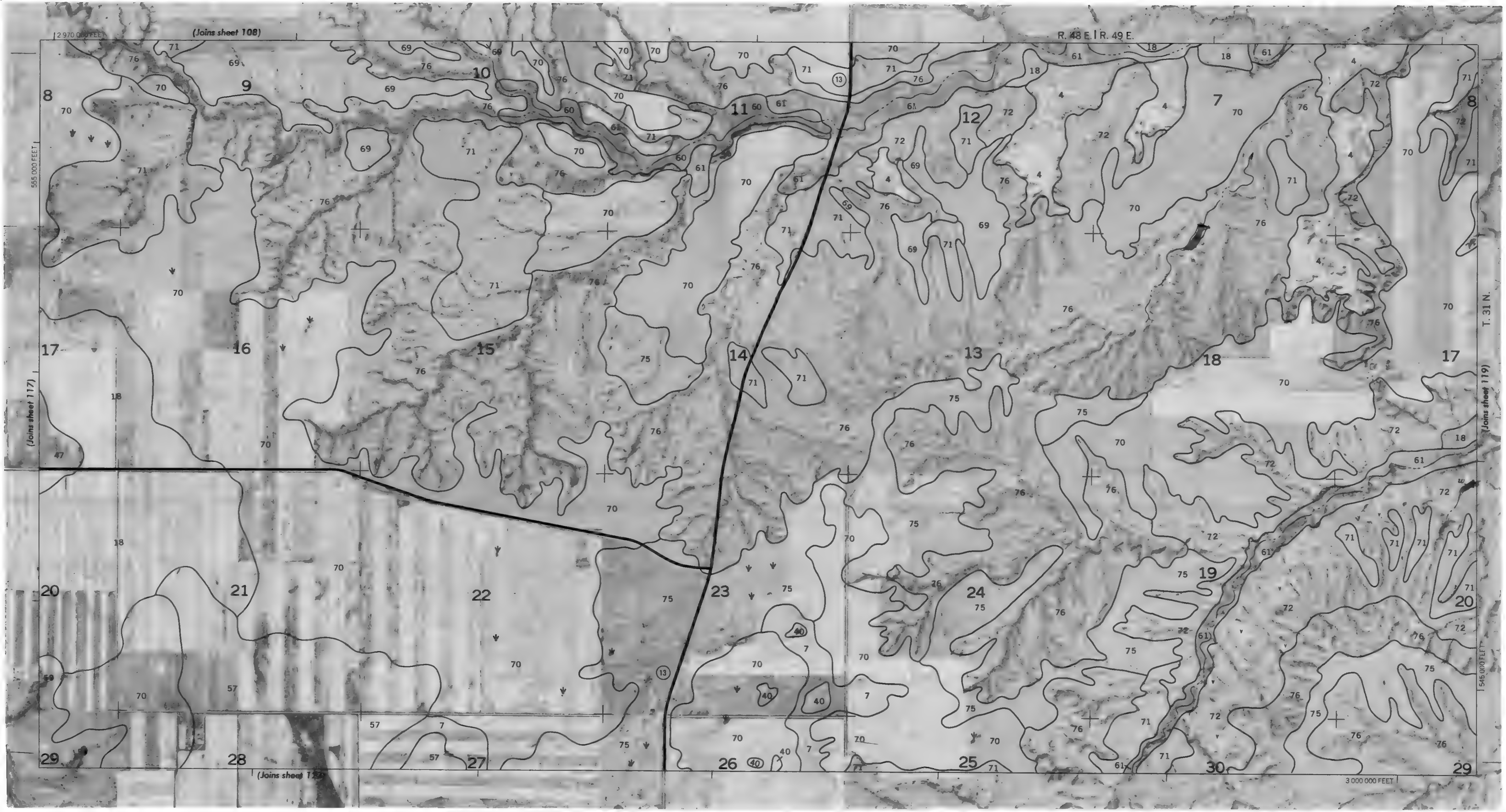
1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 118



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 118

N

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

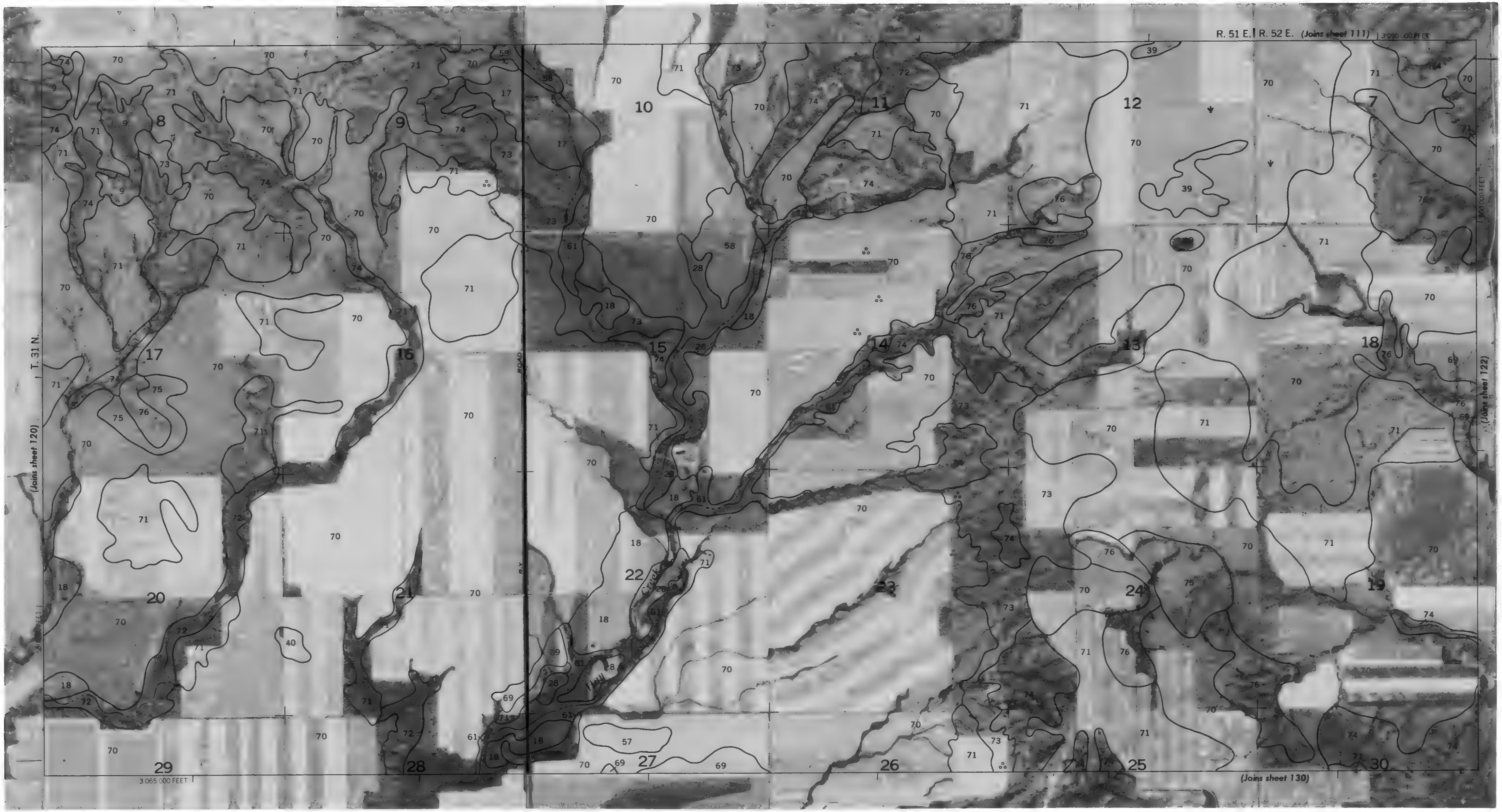
ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 120

121

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 121

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

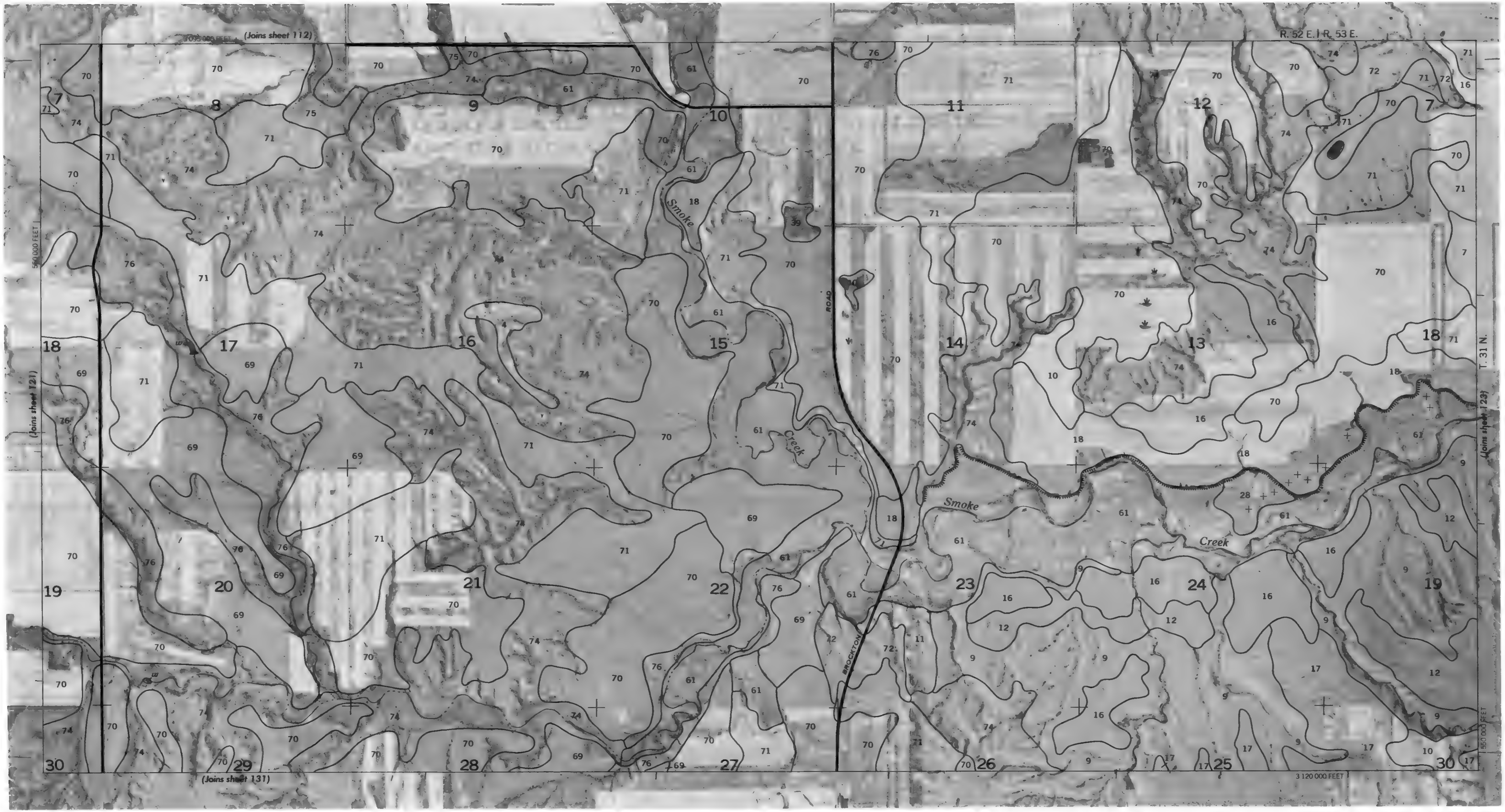


1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N

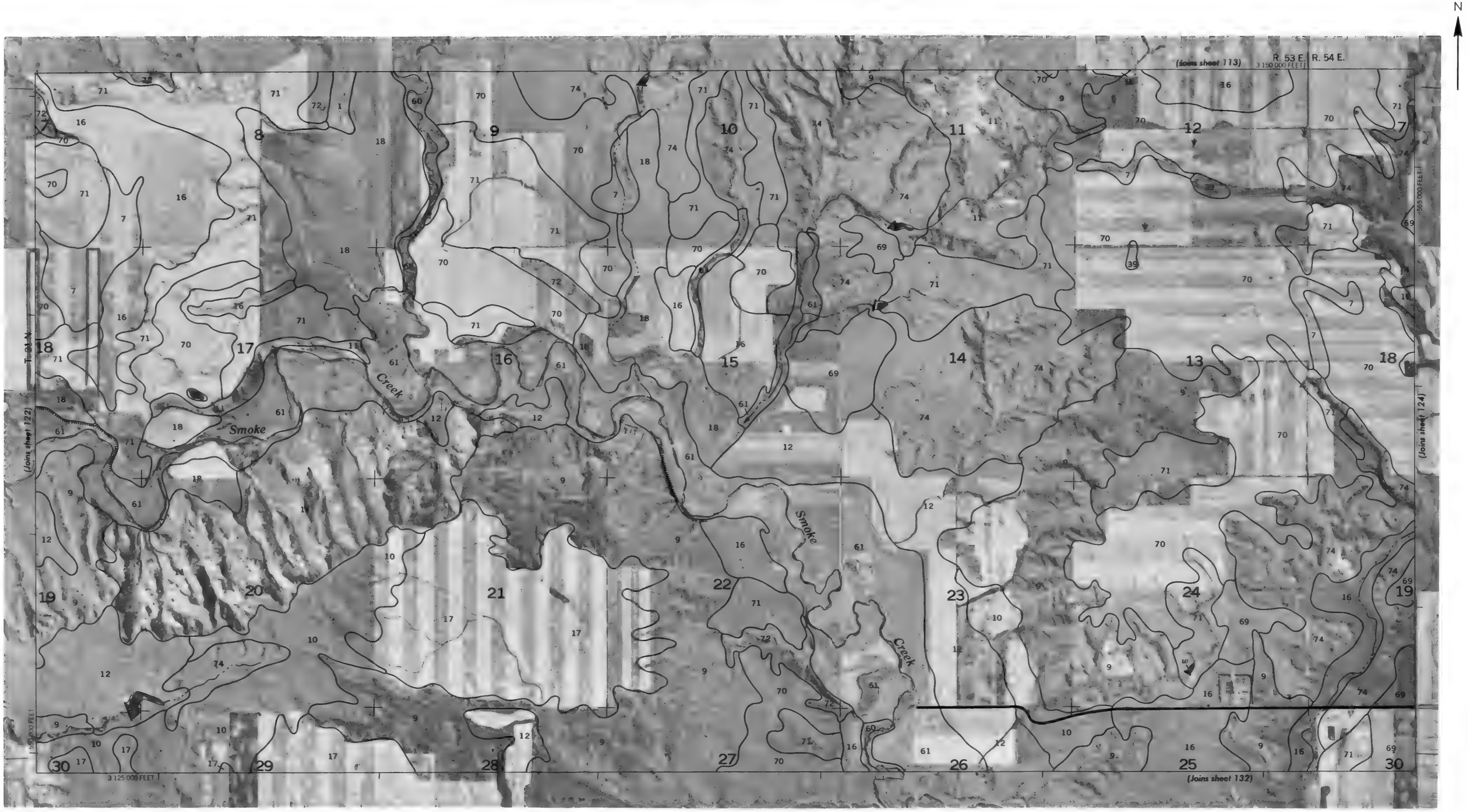


1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.



1 ¾ ½ ¼ 0 1 2 Miles

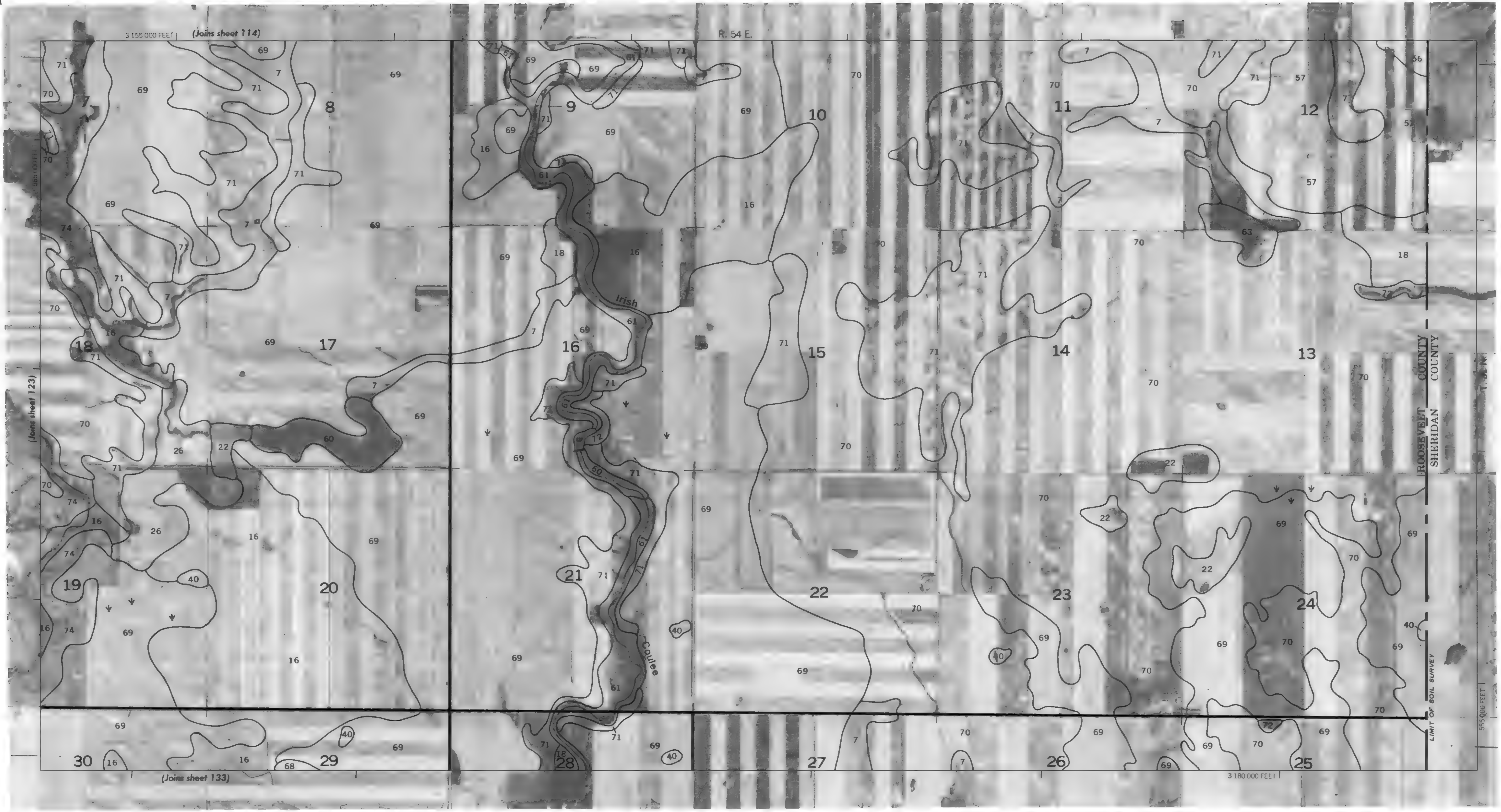
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 123

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

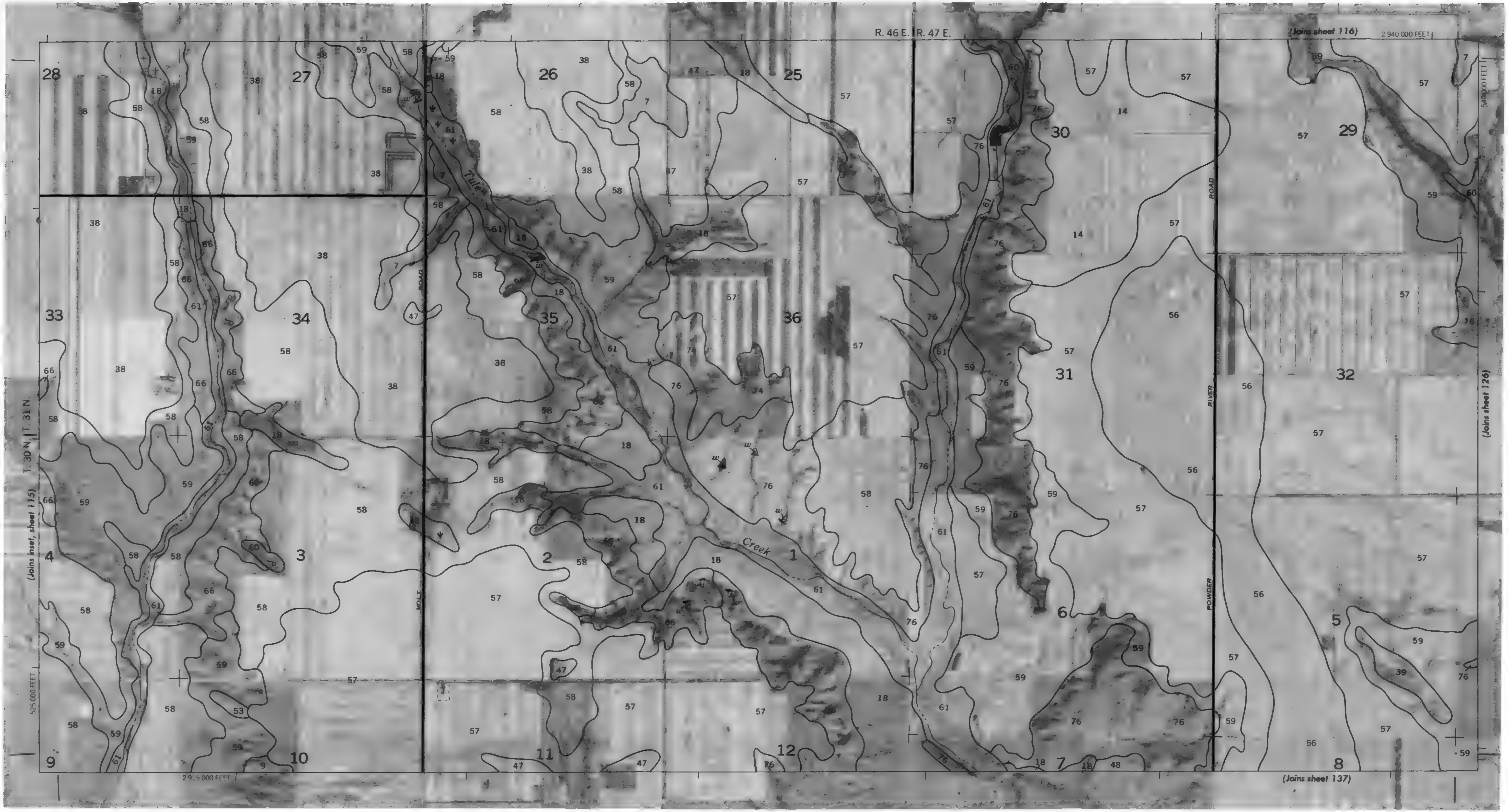
Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 125

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 126

N

1 ¾ ½ ¼ 0 1 2 Miles

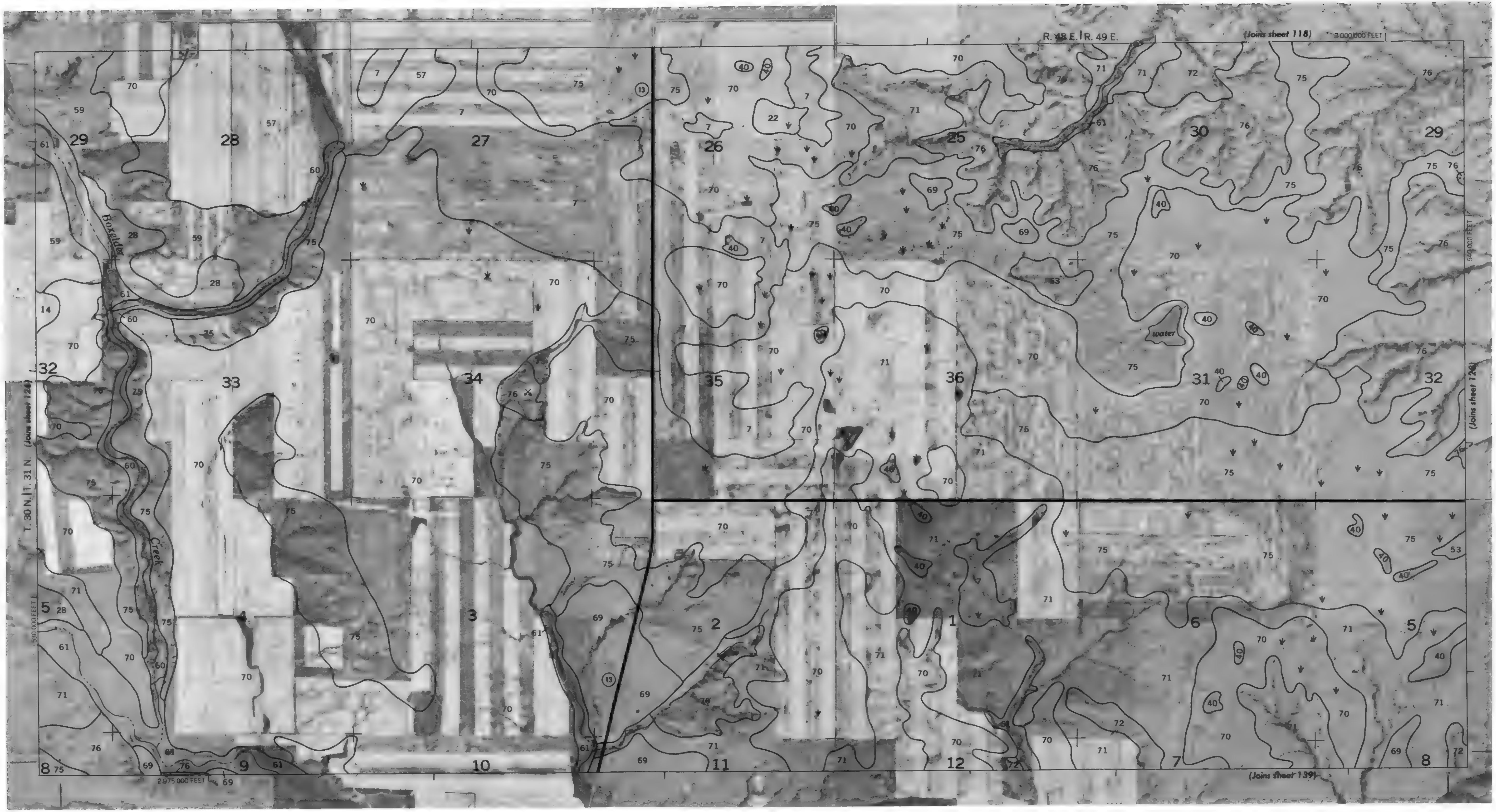
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

N



1 ¾ ½ ¼ 0 1 2 Miles

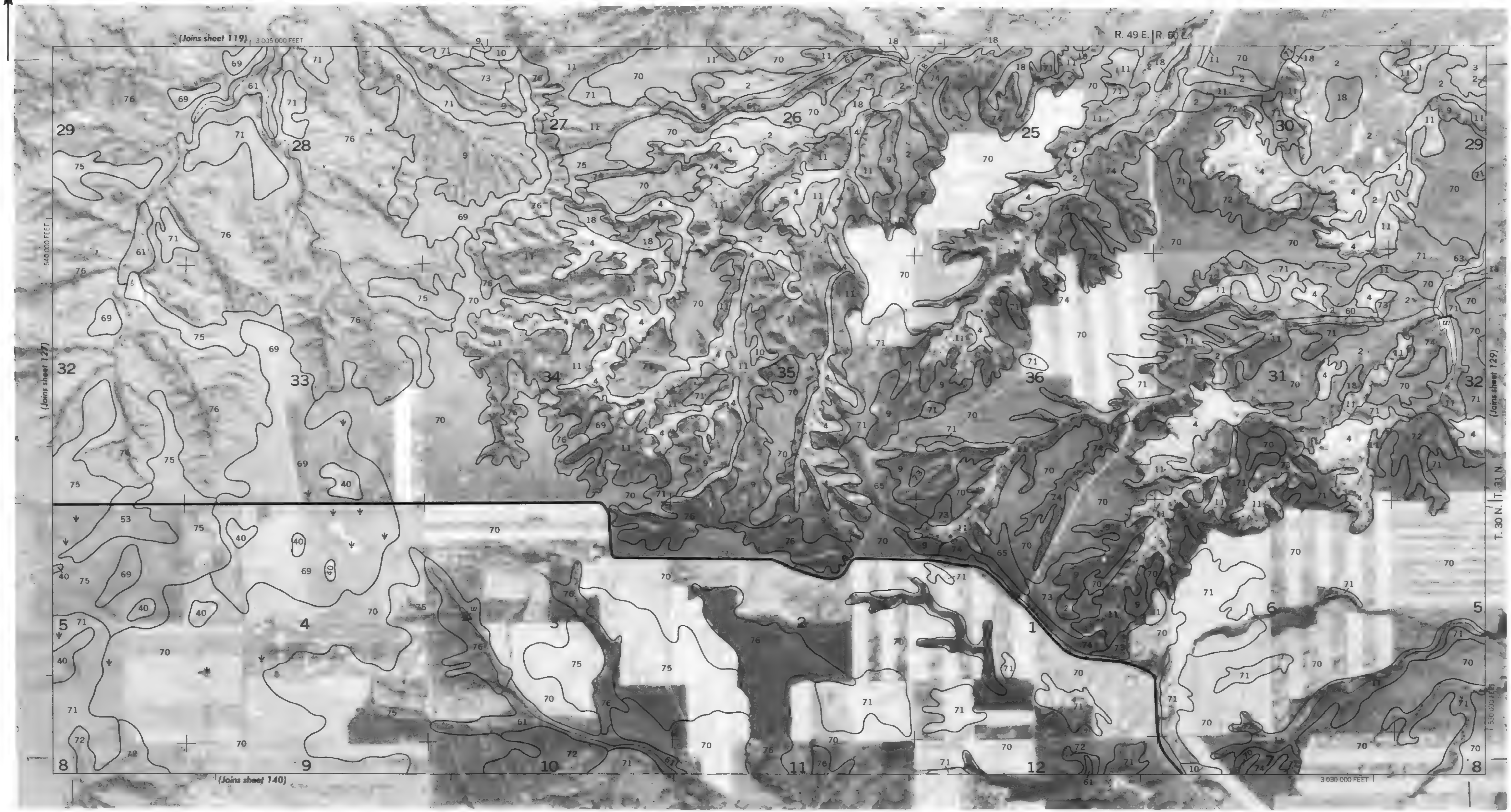
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 127

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N



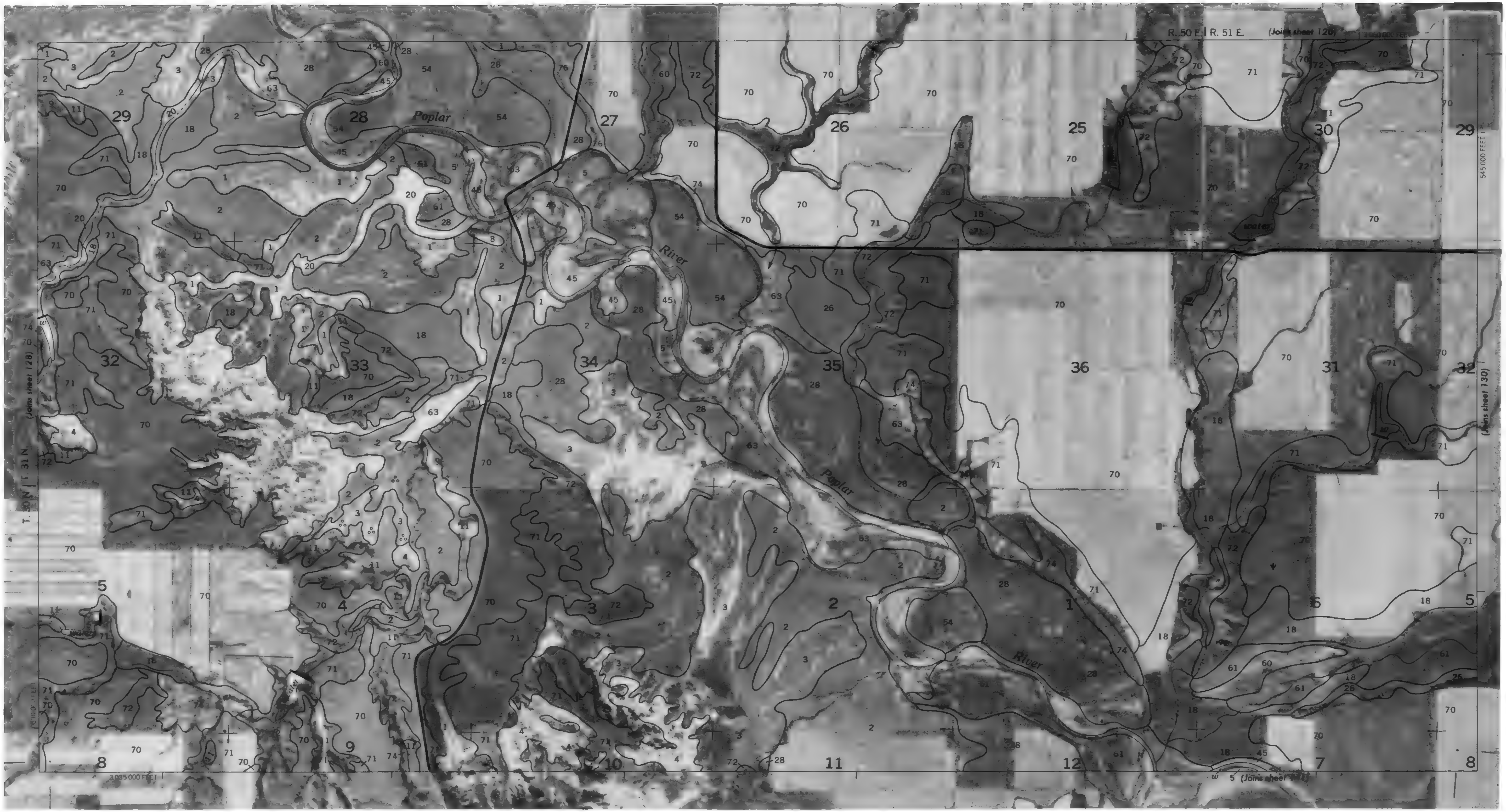
1 ¾ ½ ¼ 0 1 2 Miles
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet
Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 128

N

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 130

N

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned

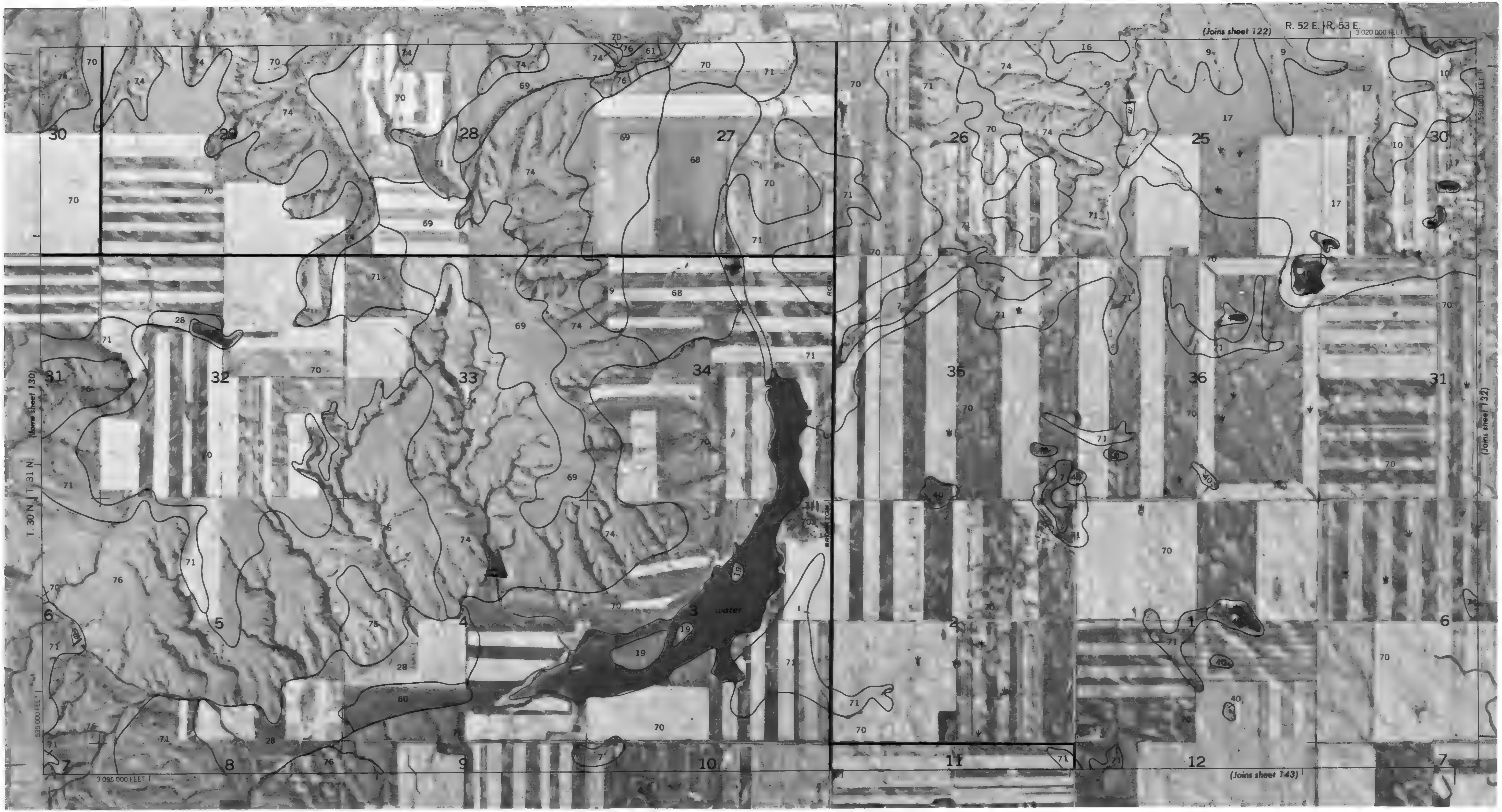
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 130

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 131

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N

1 ¾ ½ ¼ 0 1 2 Miles

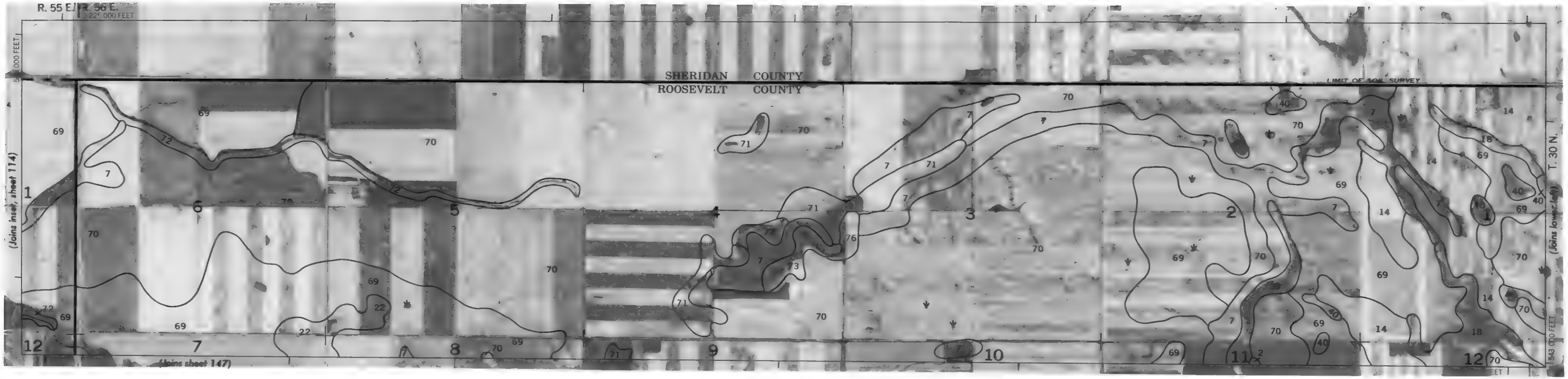
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

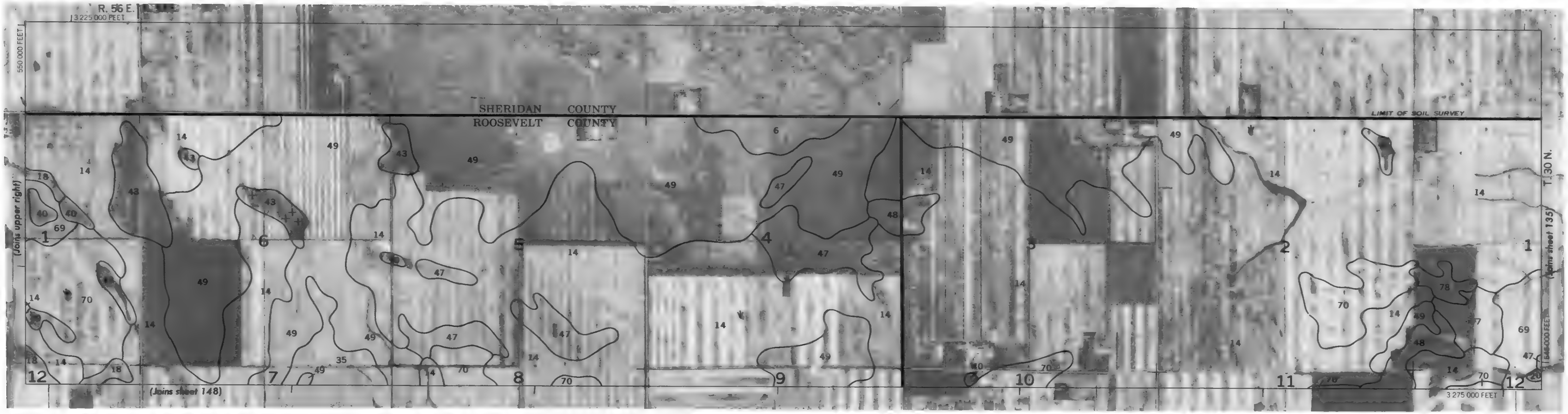
Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 133

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N





1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

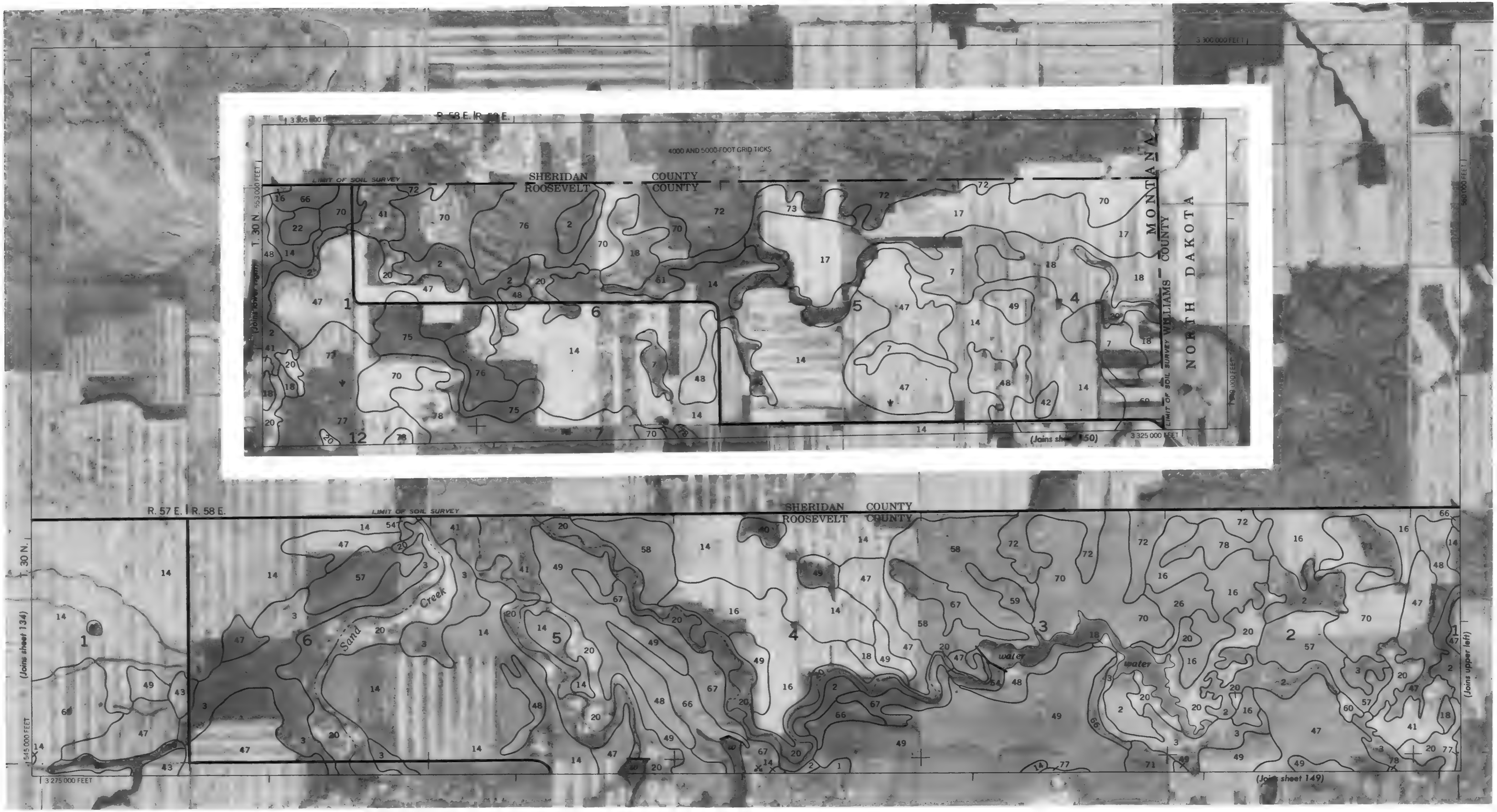
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 135

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

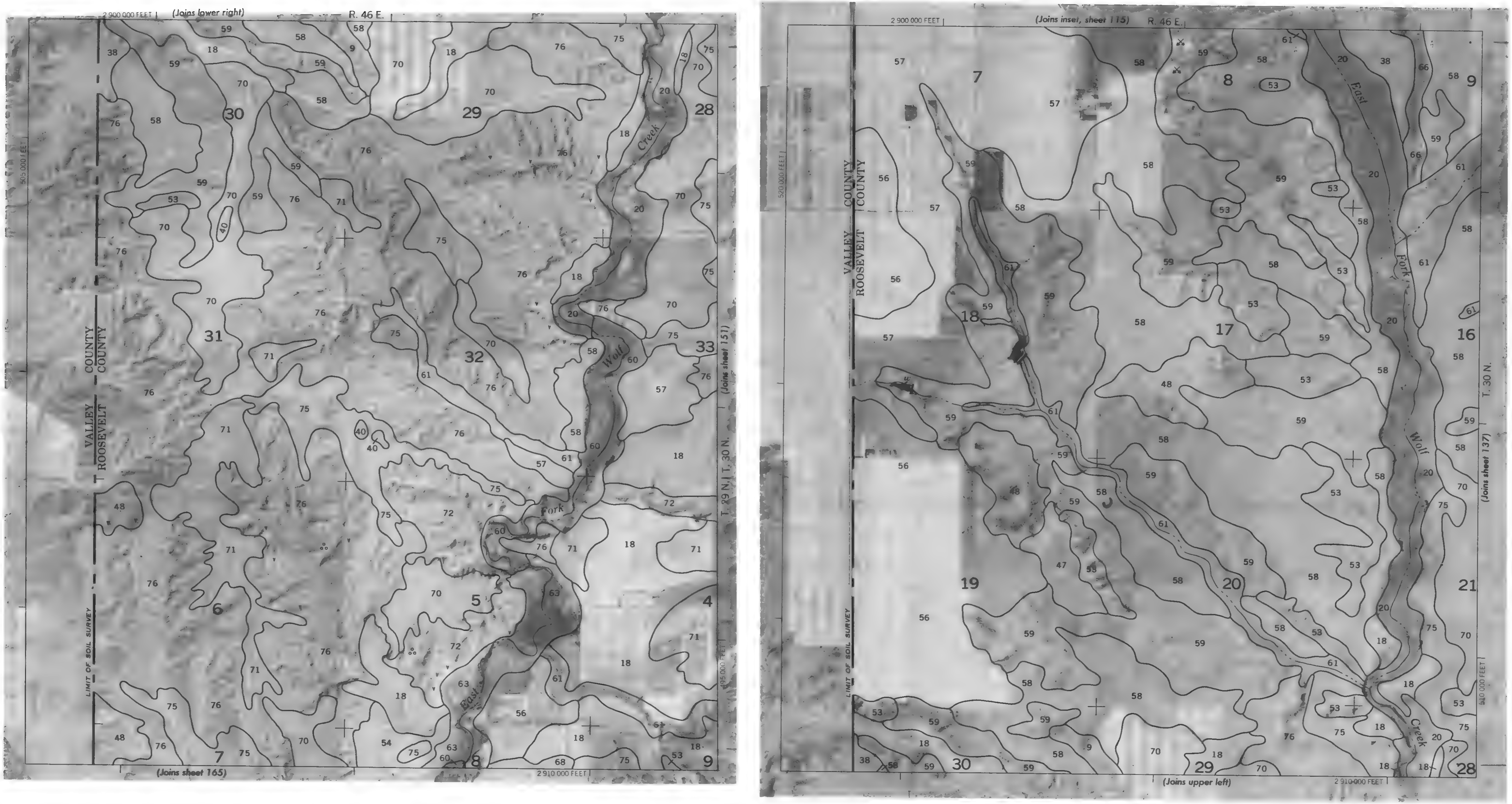


1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

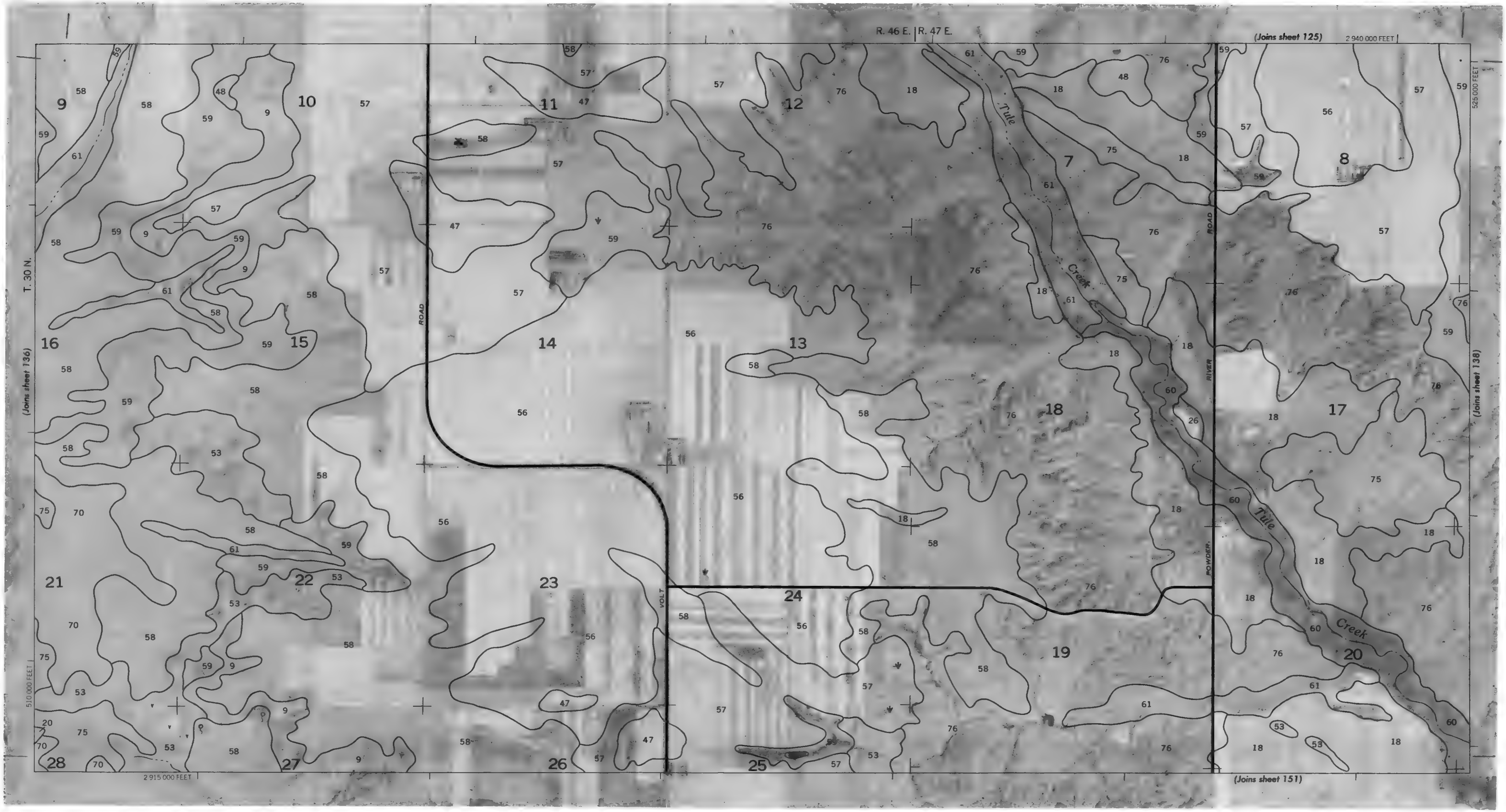
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 137

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned

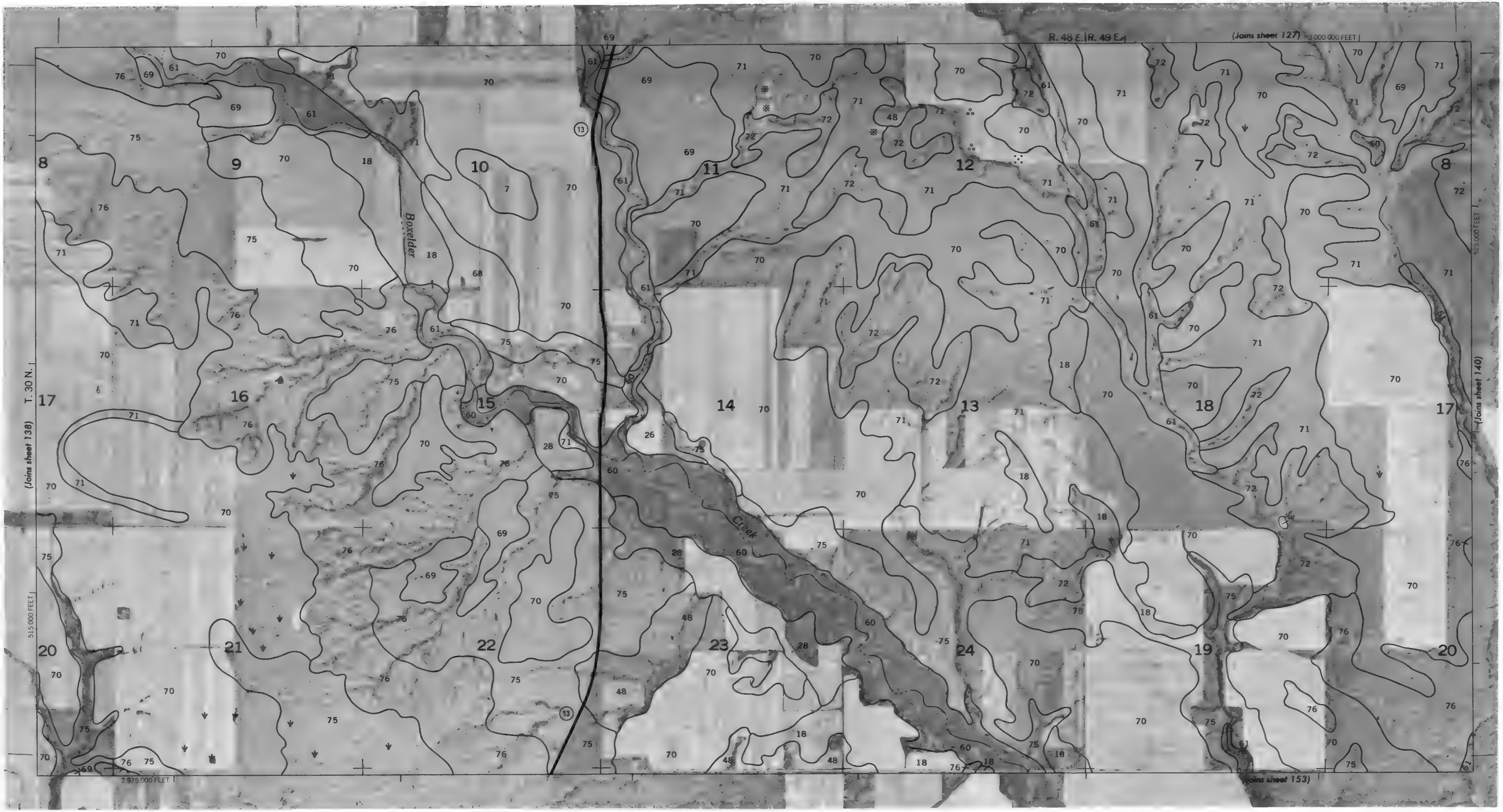
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 138

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 139

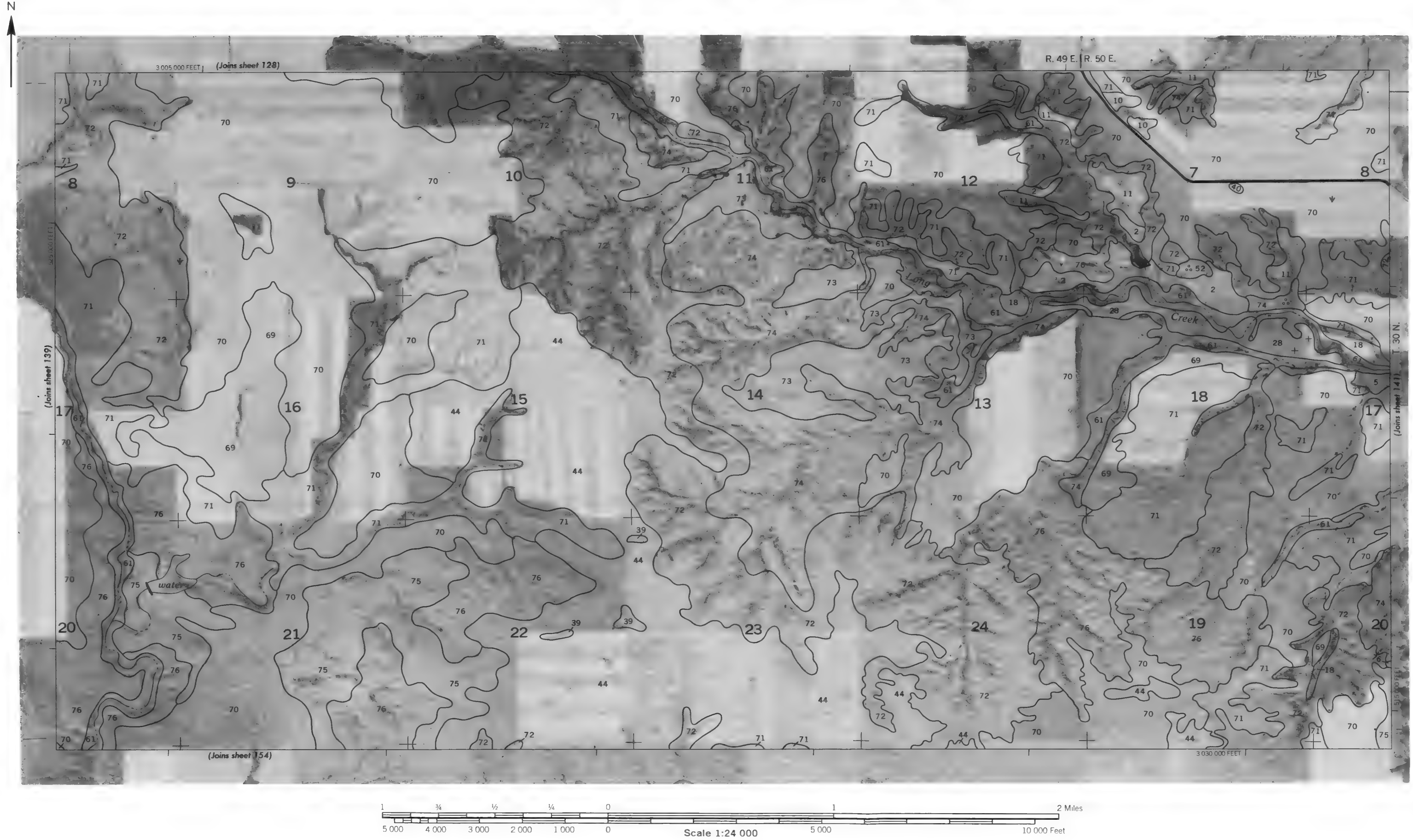
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000



Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 141

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 142

N

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

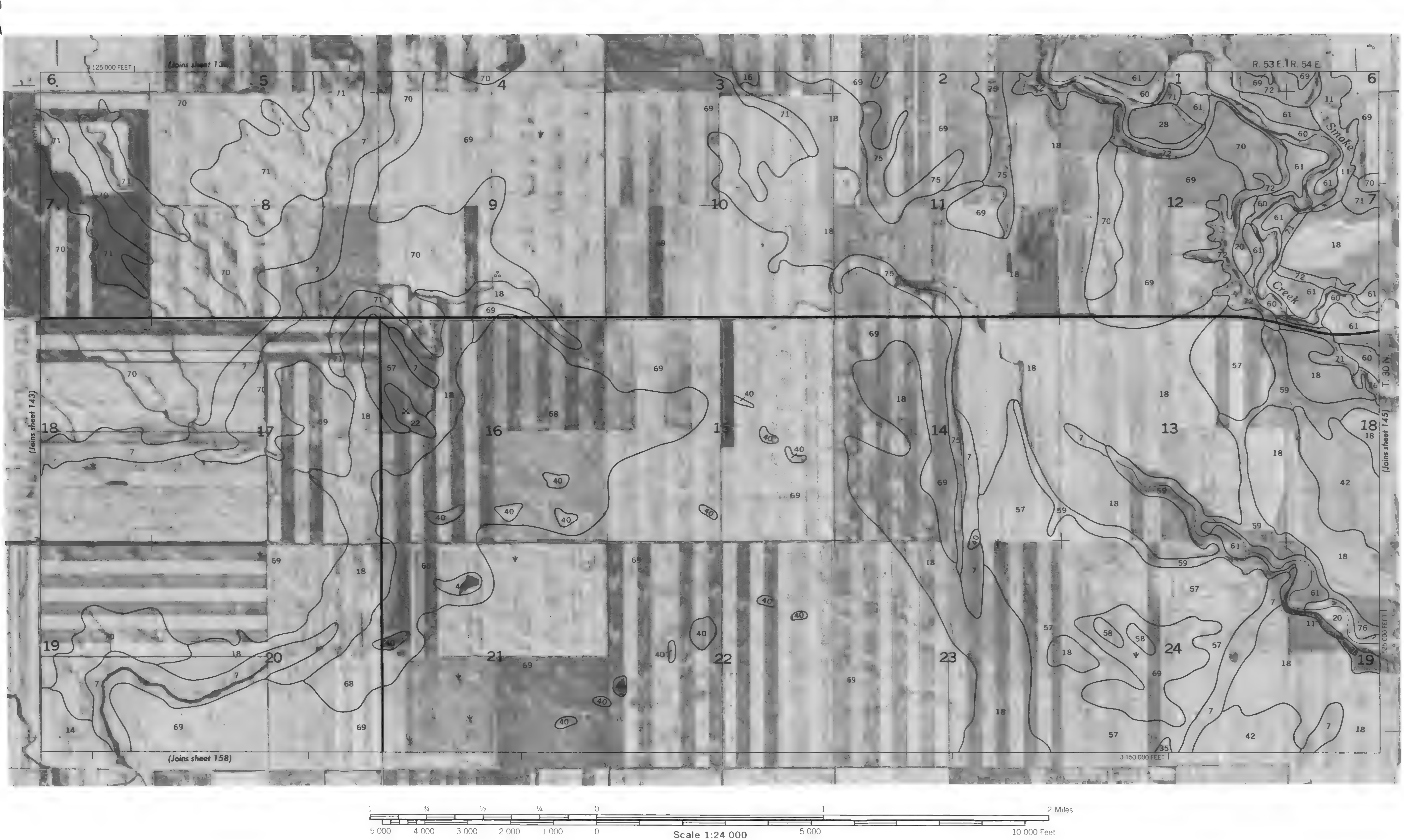
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned

N

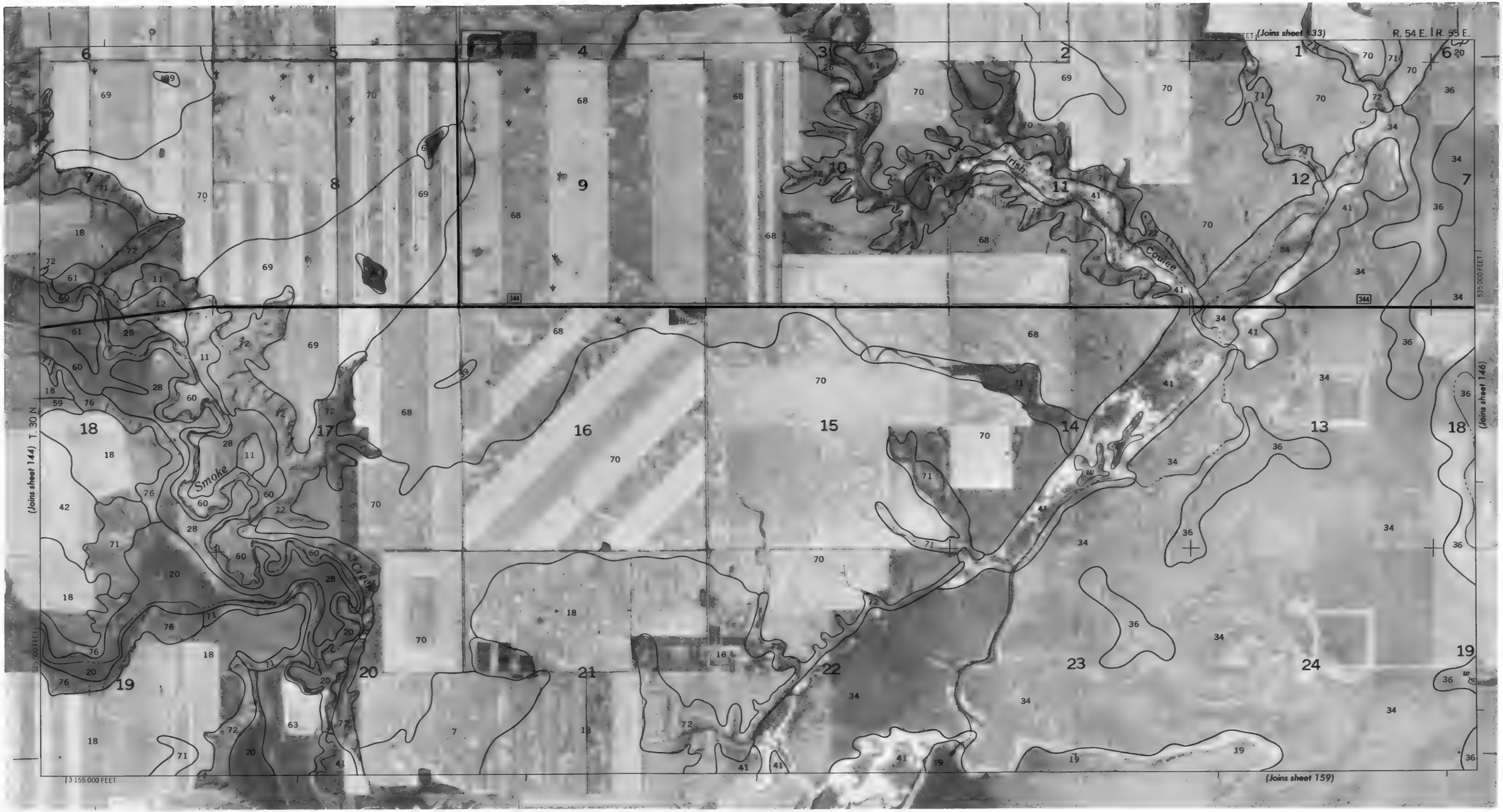
ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 144



This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

145

N



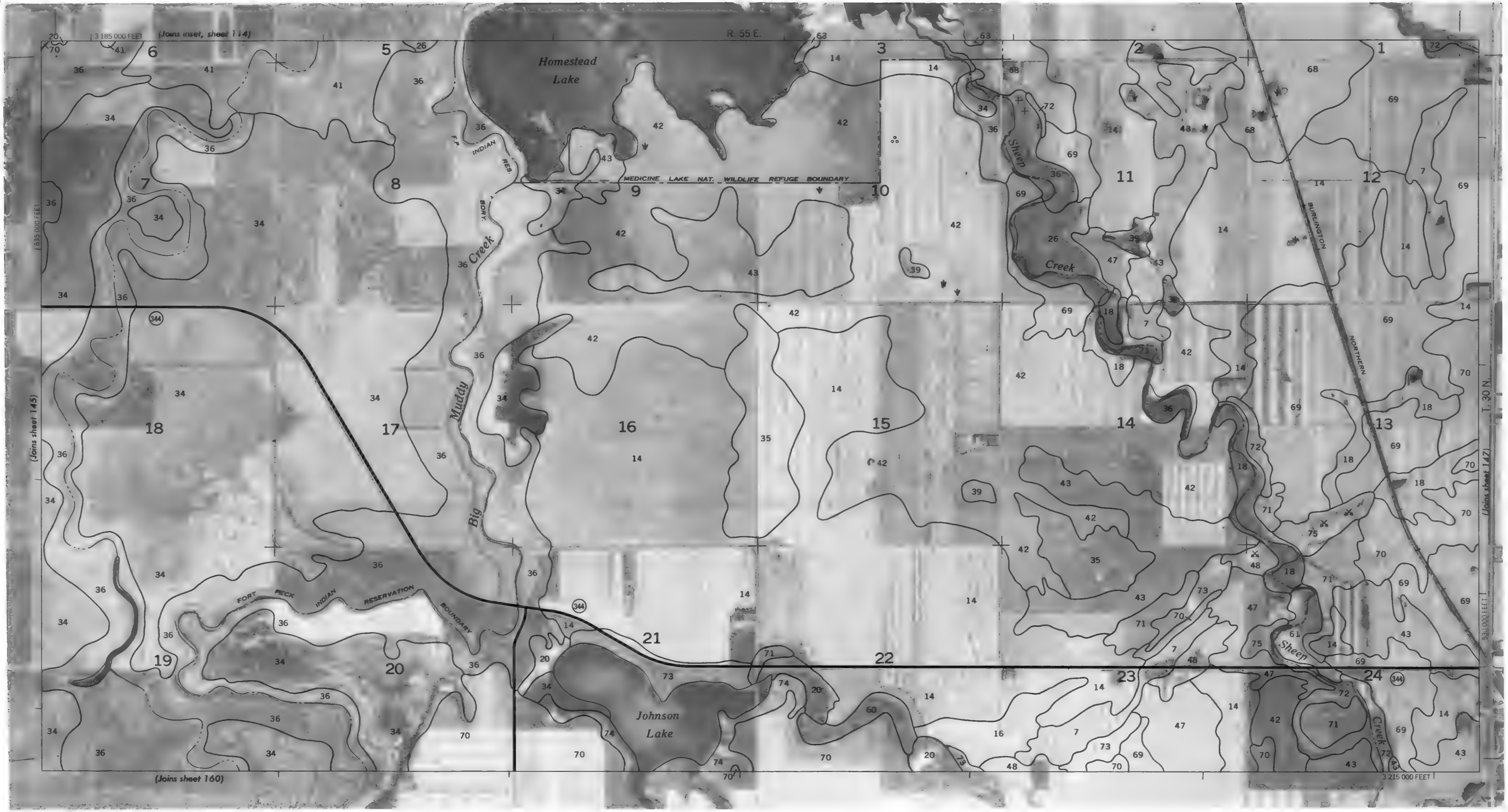
Scale 1:24 000

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 145

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

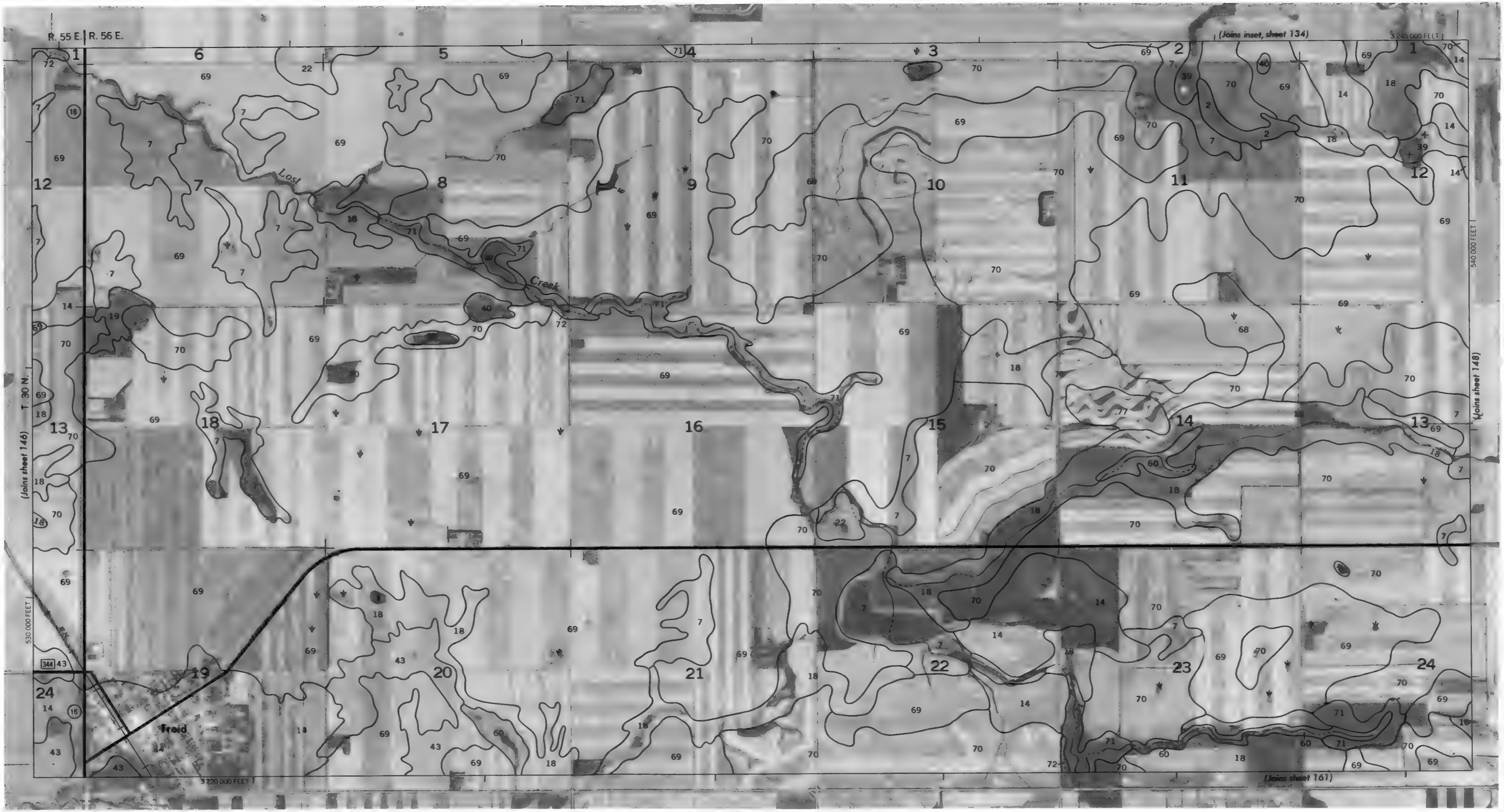
ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 146

147

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 147

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



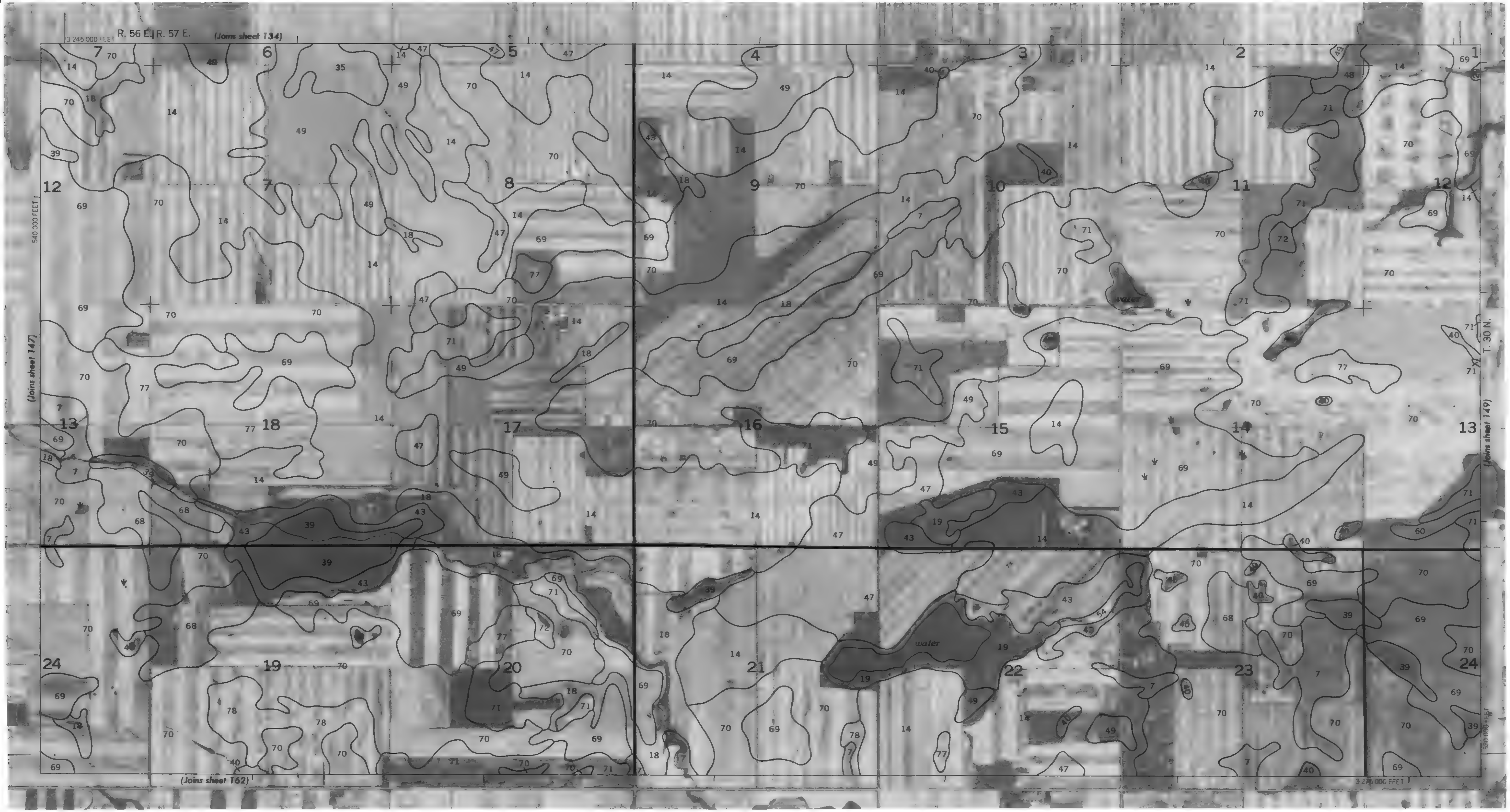
1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 148

N



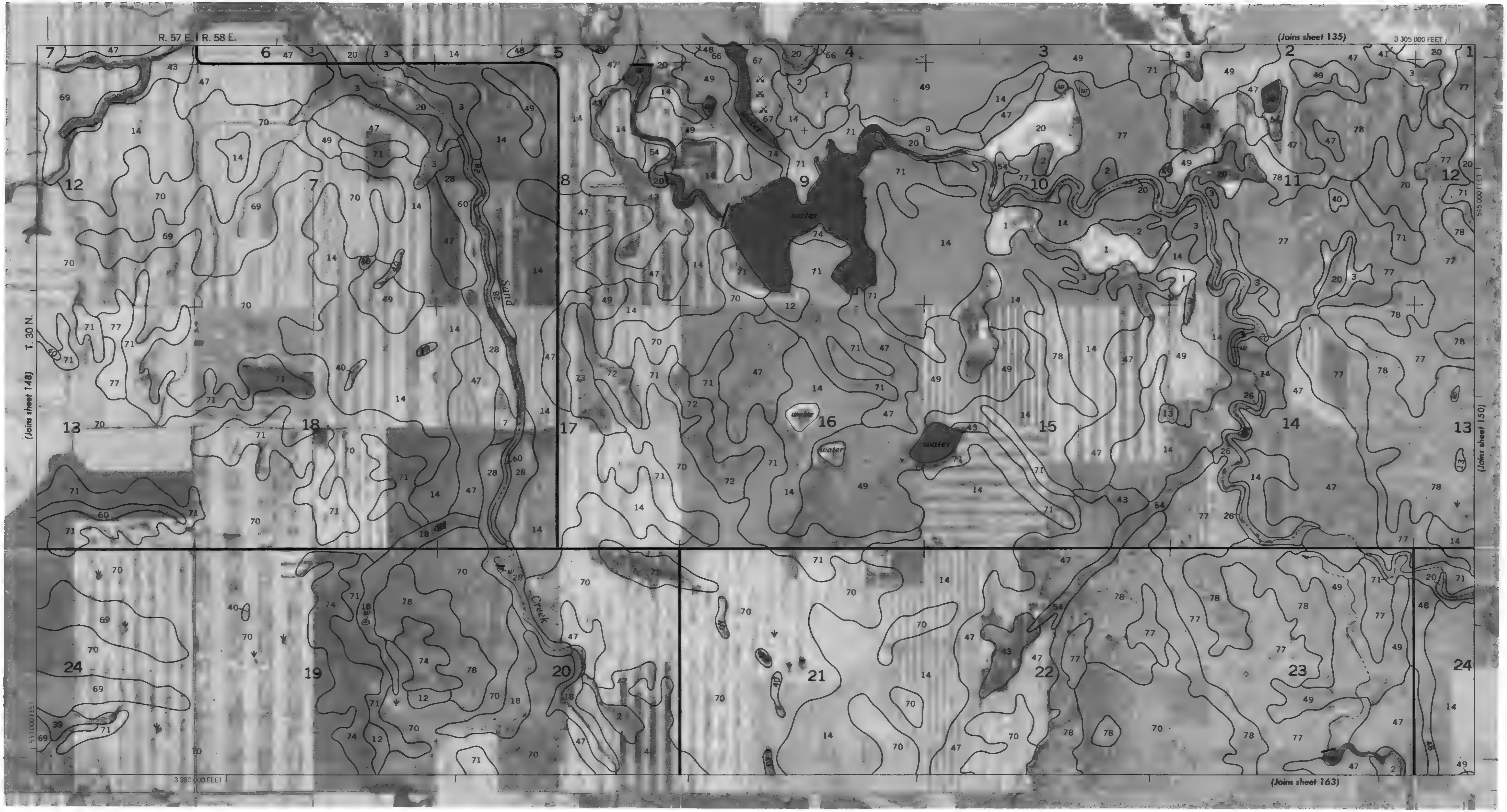
1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N



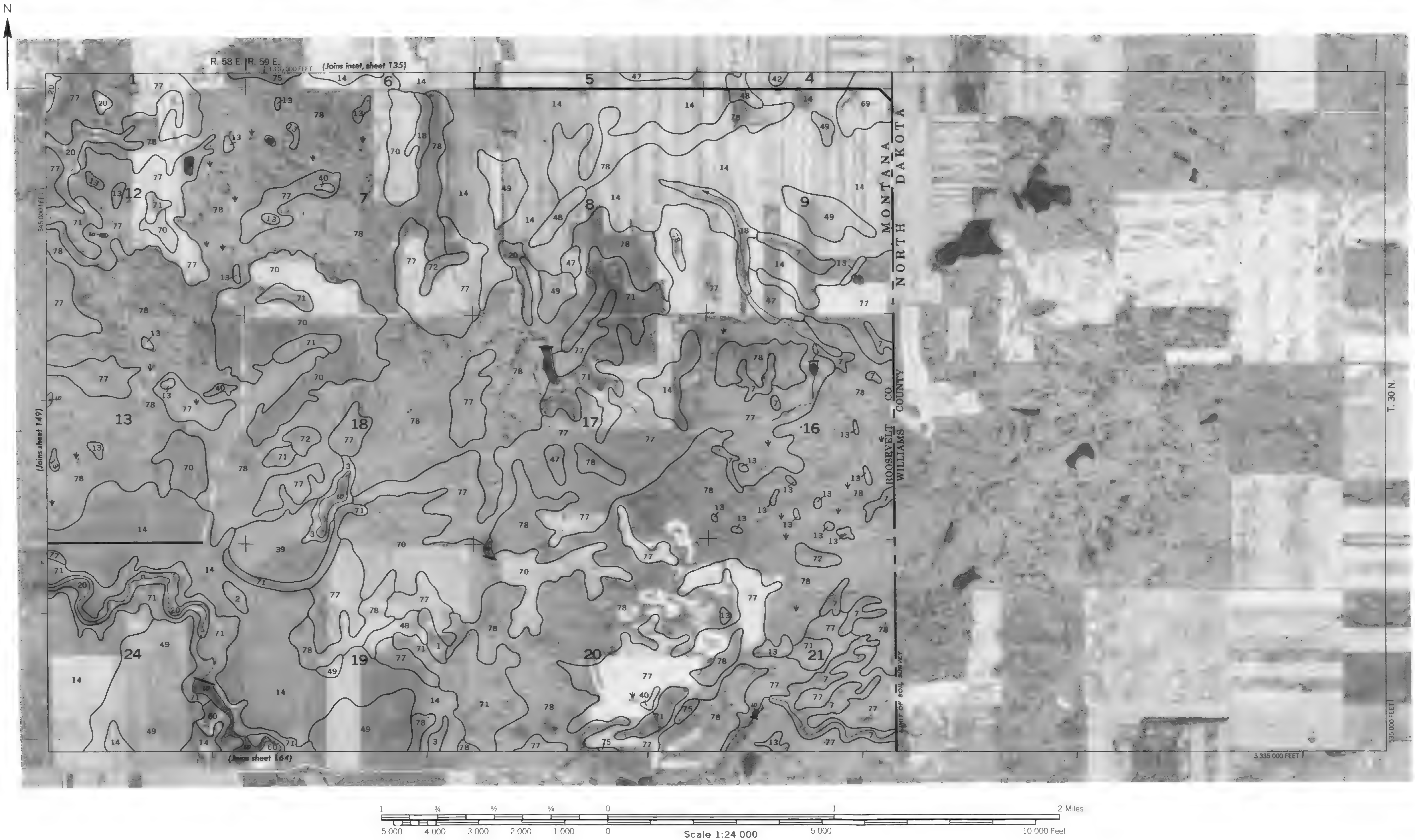
1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 149

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

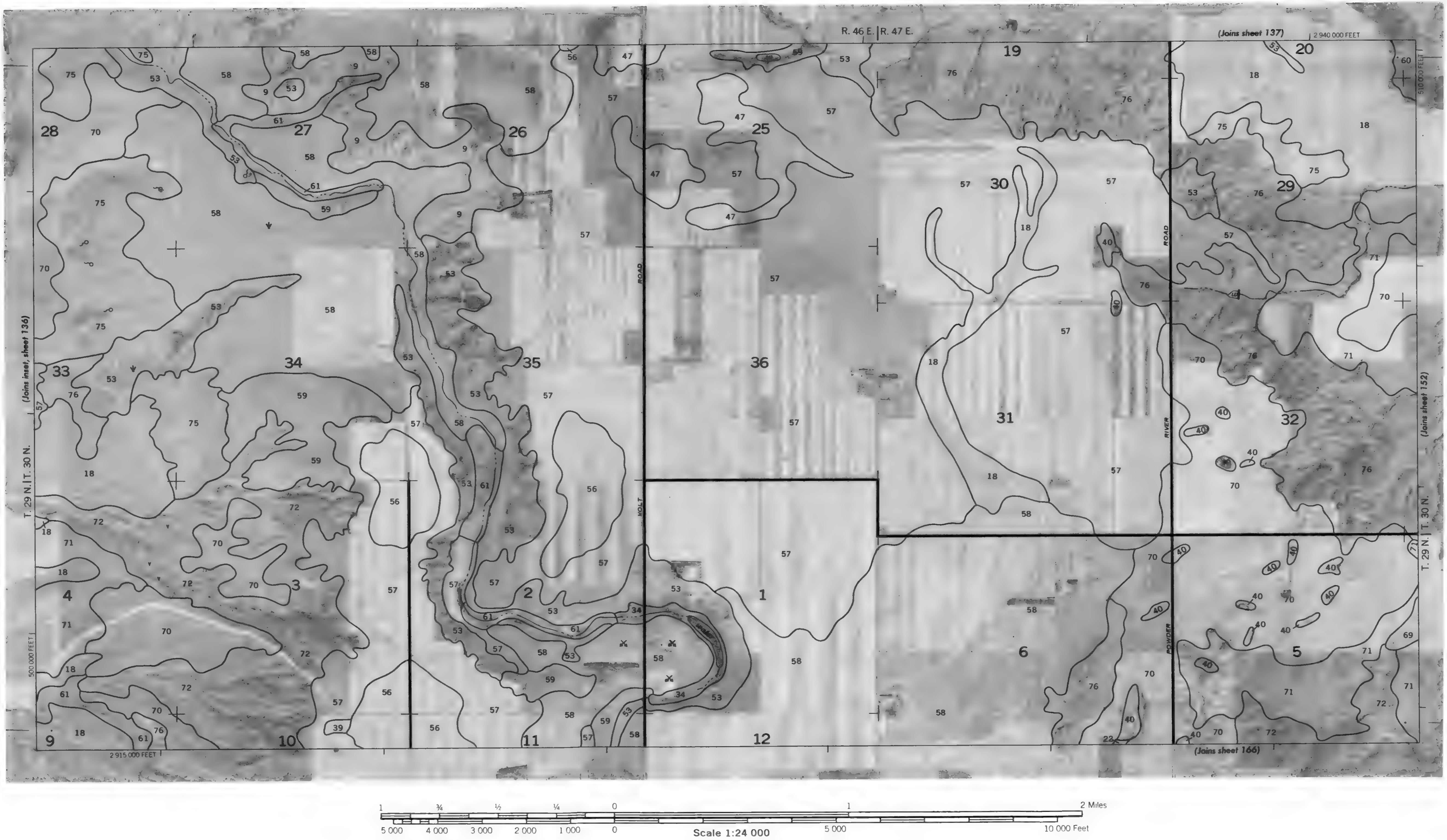


Coordinate grid ticks and land division corners, if shown, are approximately positioned

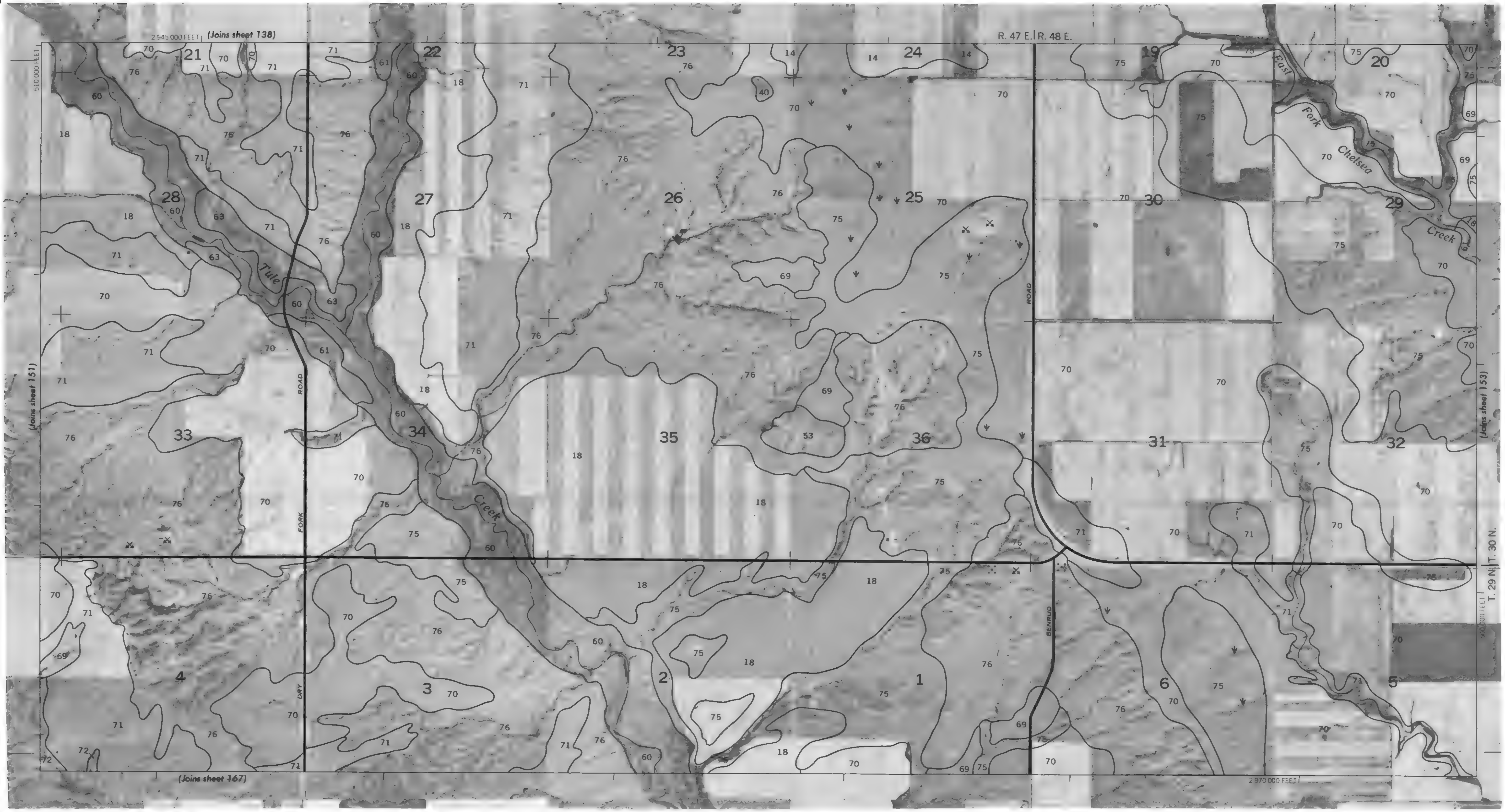
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 151

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

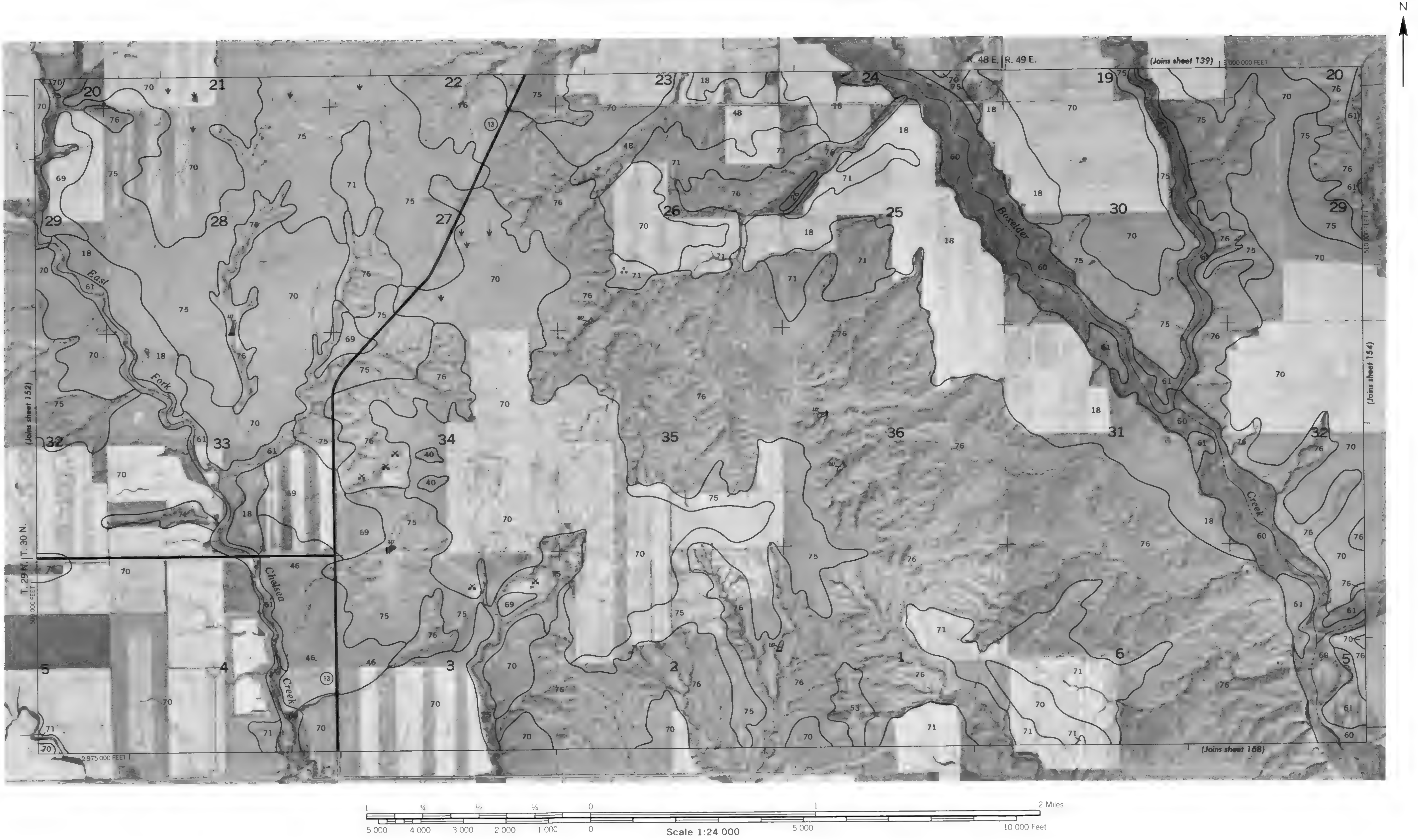
Coordinate grid ticks and land division corners, if shown, are approximately positioned

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

153

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 153

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned



N

1 ¾ ½ ¼ 0 1 2 Miles

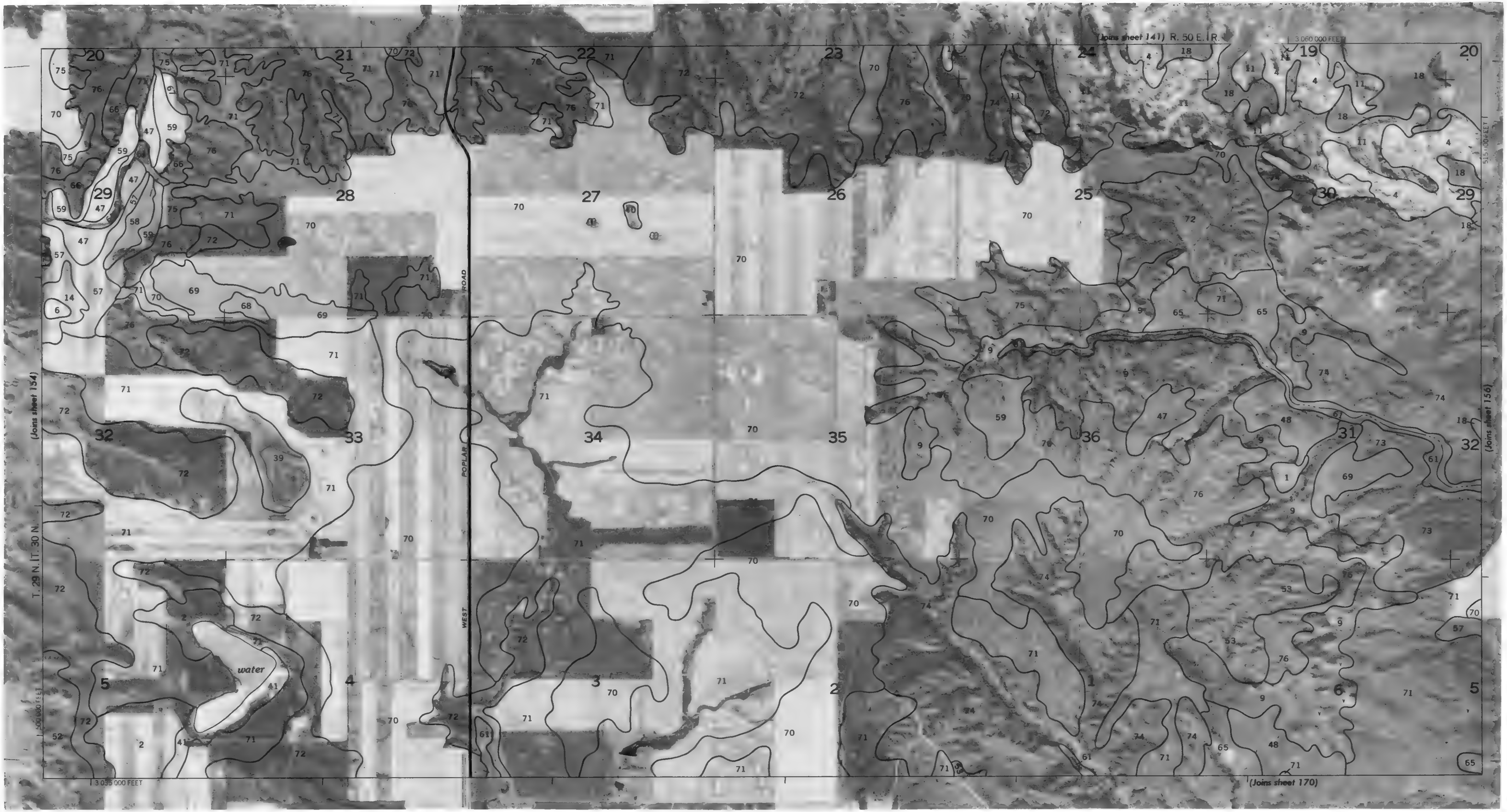
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

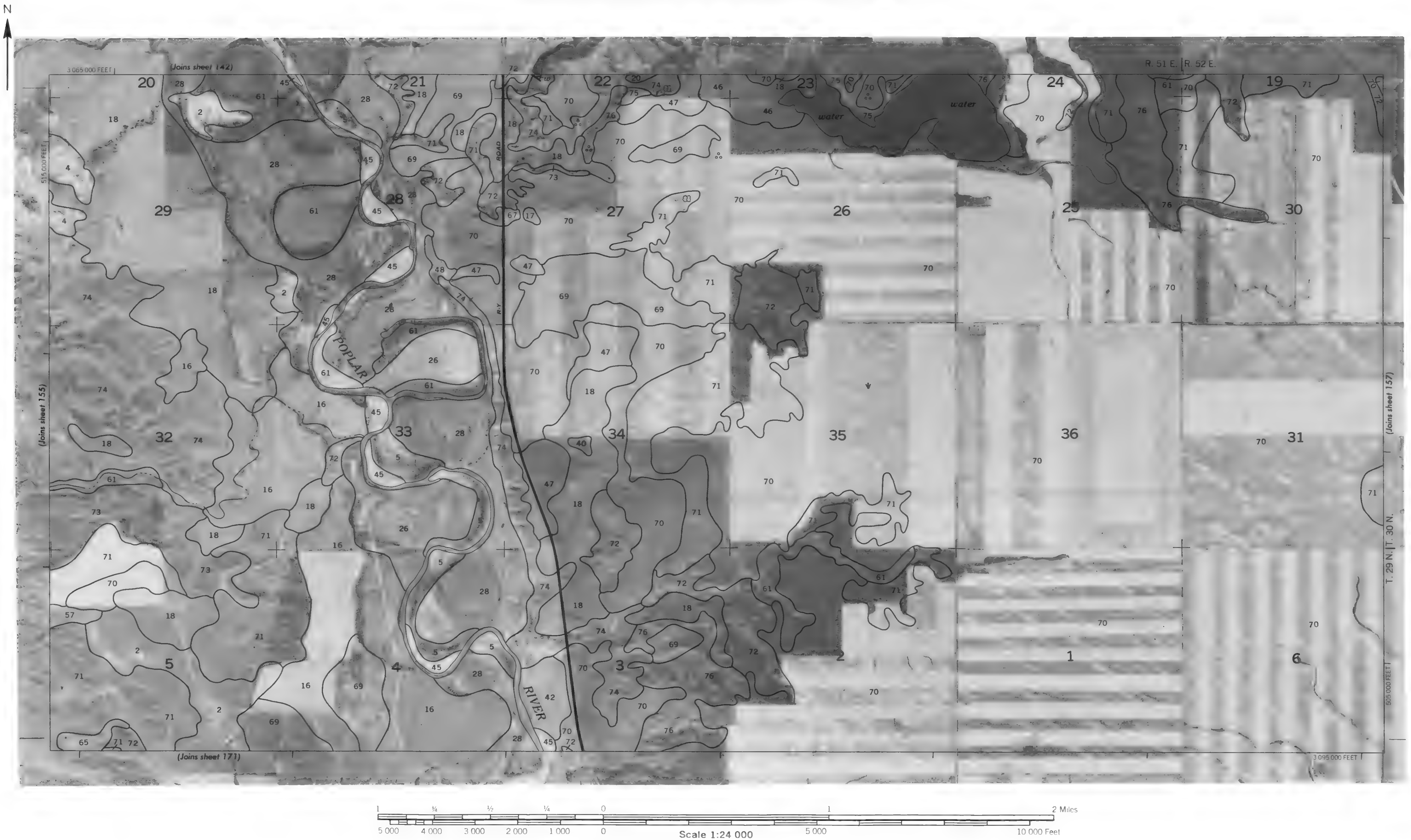


1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 156

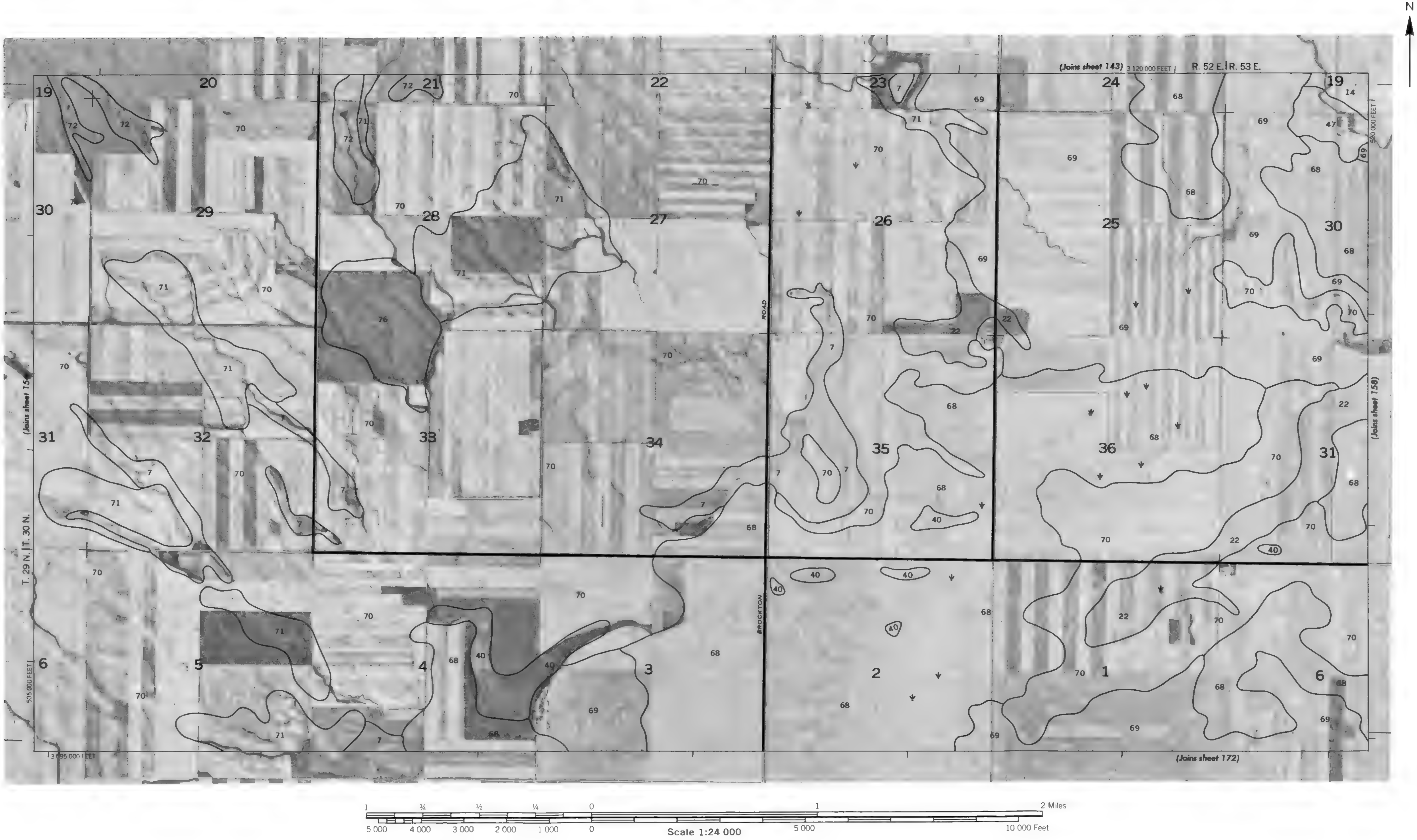


Coordinate grid ticks and land division corners, if shown, are approximately positioned

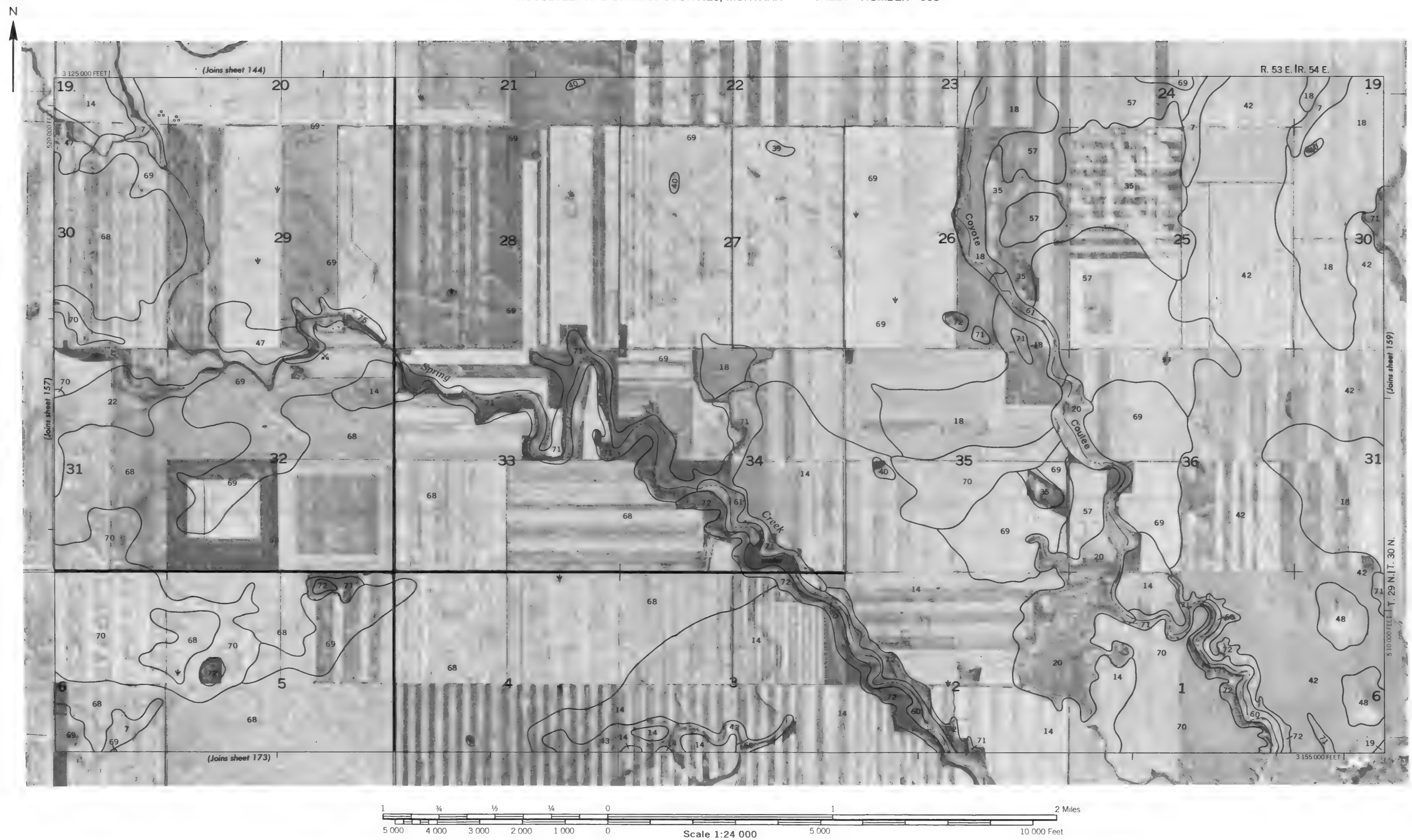
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 157

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



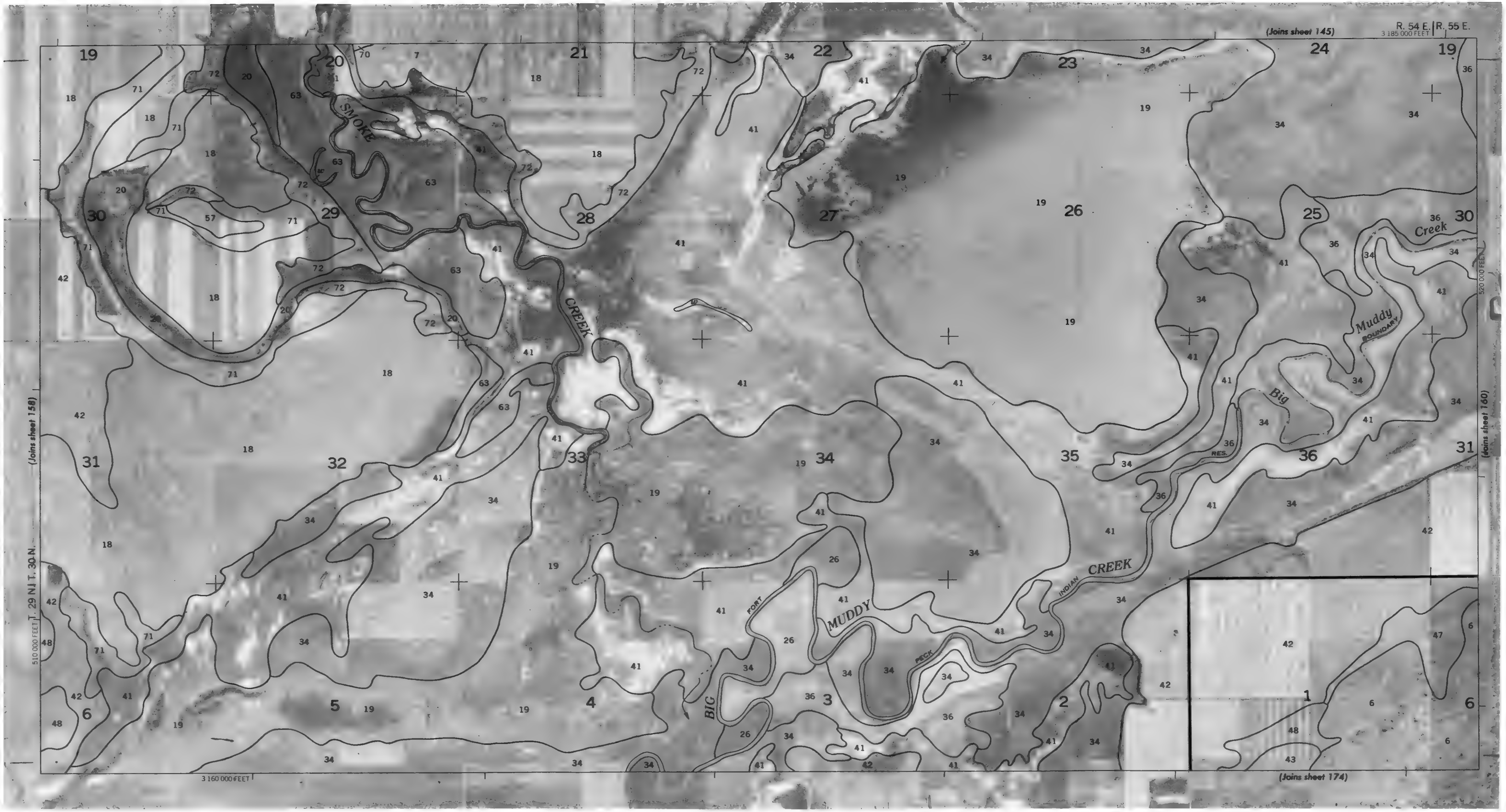
ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 158



Coordinate grid ticks and land division corners, if shown, are approximately positioned

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N



1 ¾ ½ ¼ 0 1 2 Miles

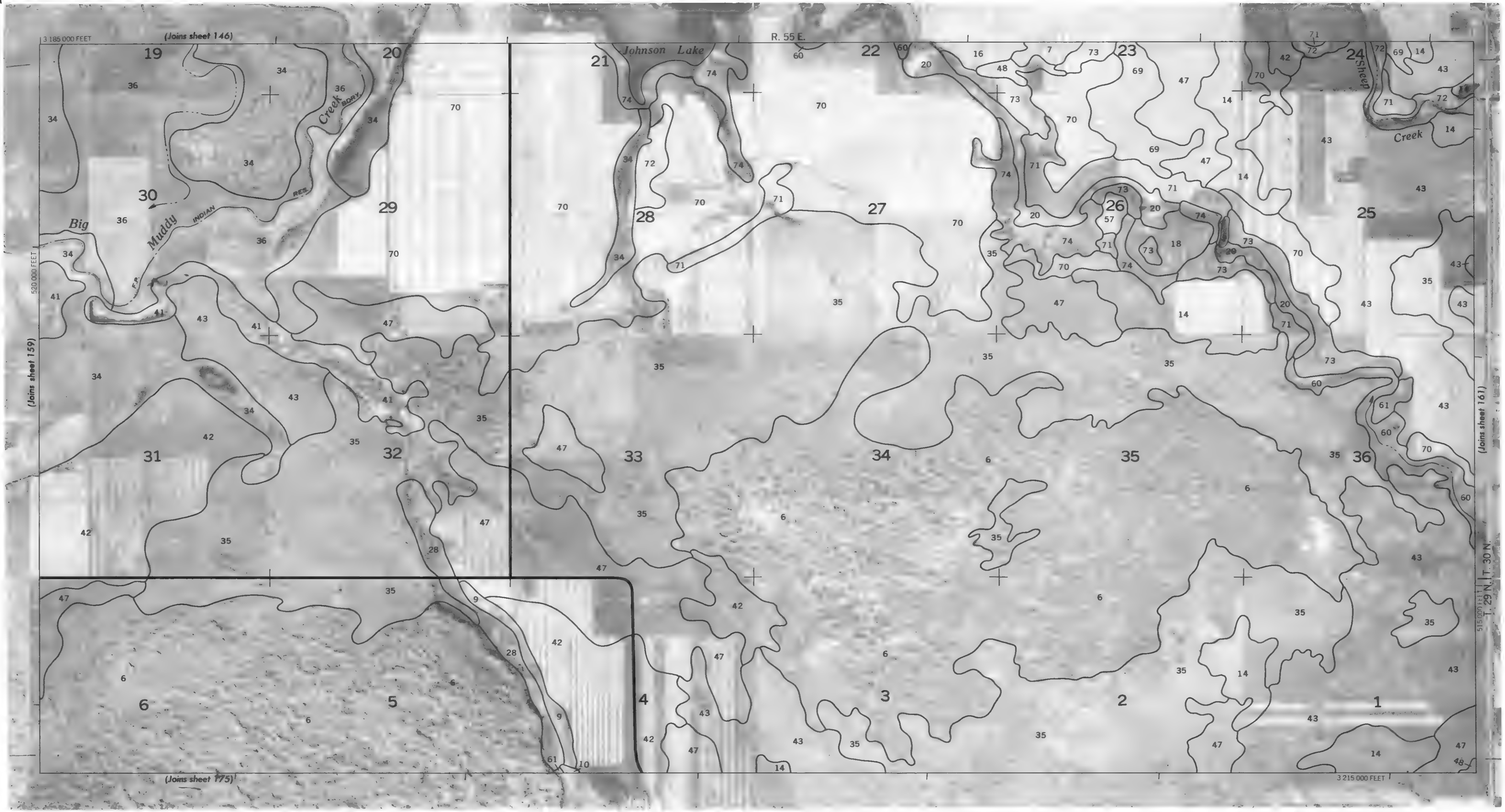
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 159

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N



Coordinate grid ticks and land division corners, if shown, are approximately positioned

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 161

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

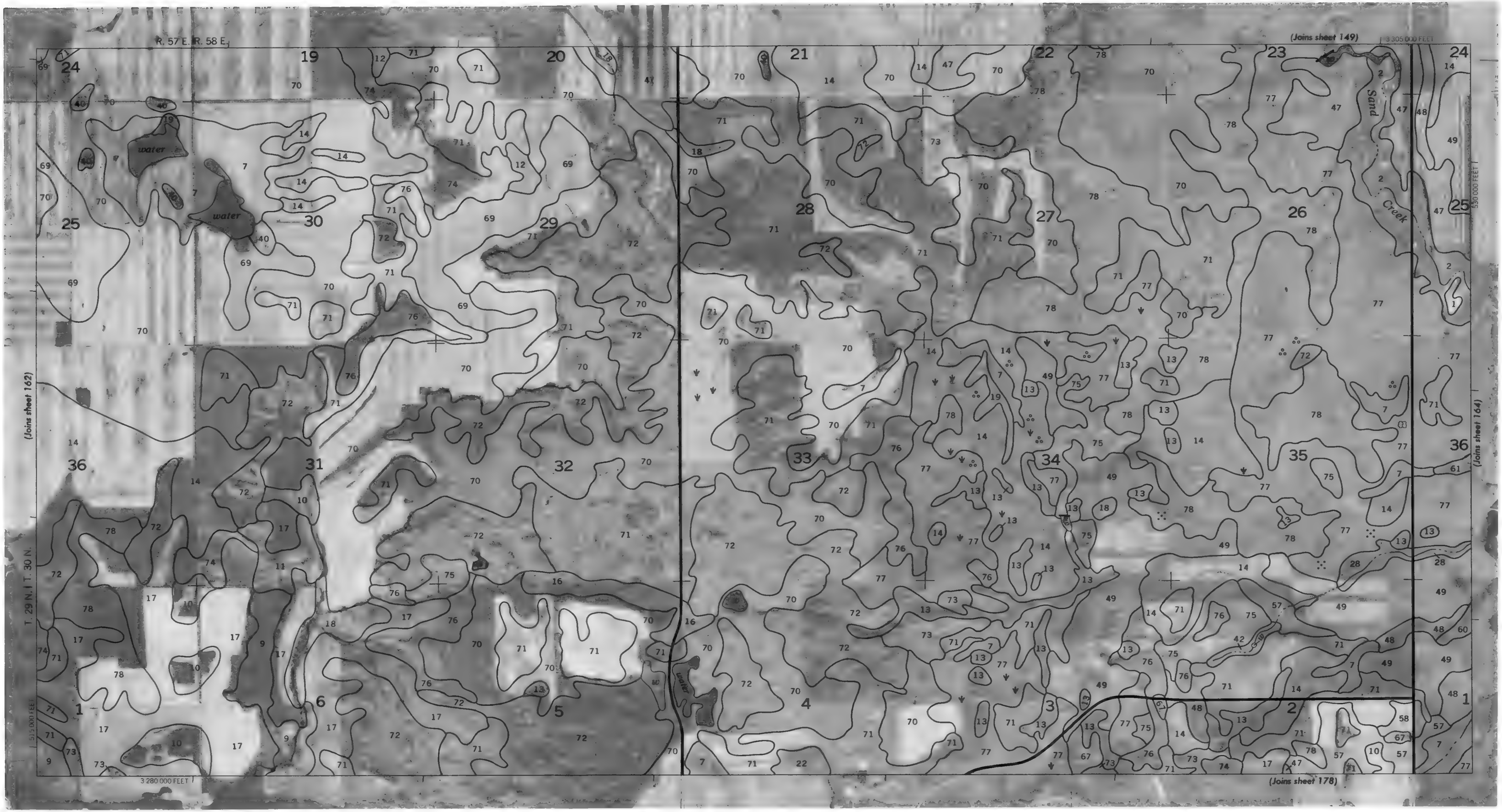
Coordinate grid ticks and land division corners, if shown, are approximately positioned

163

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 163

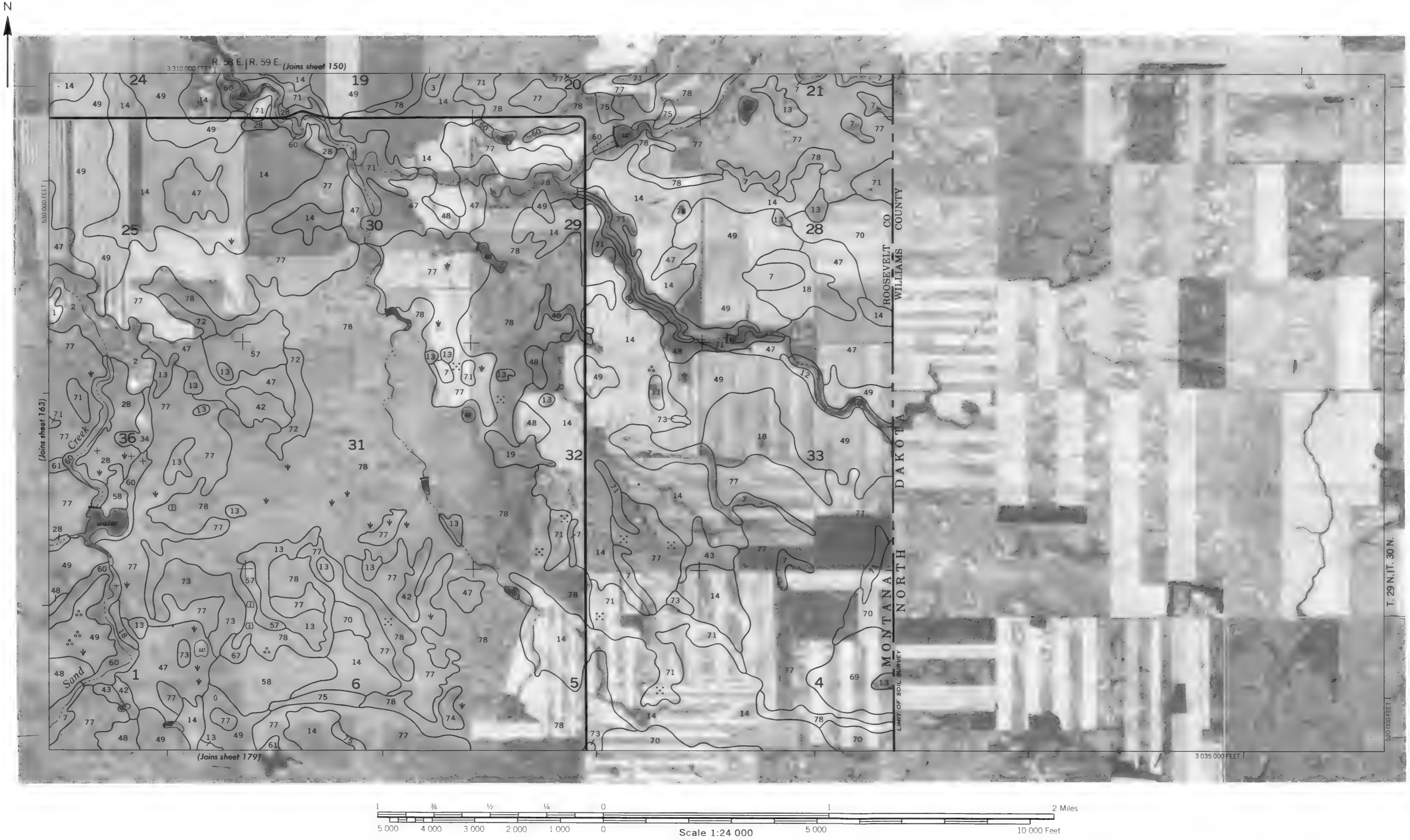
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000



This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

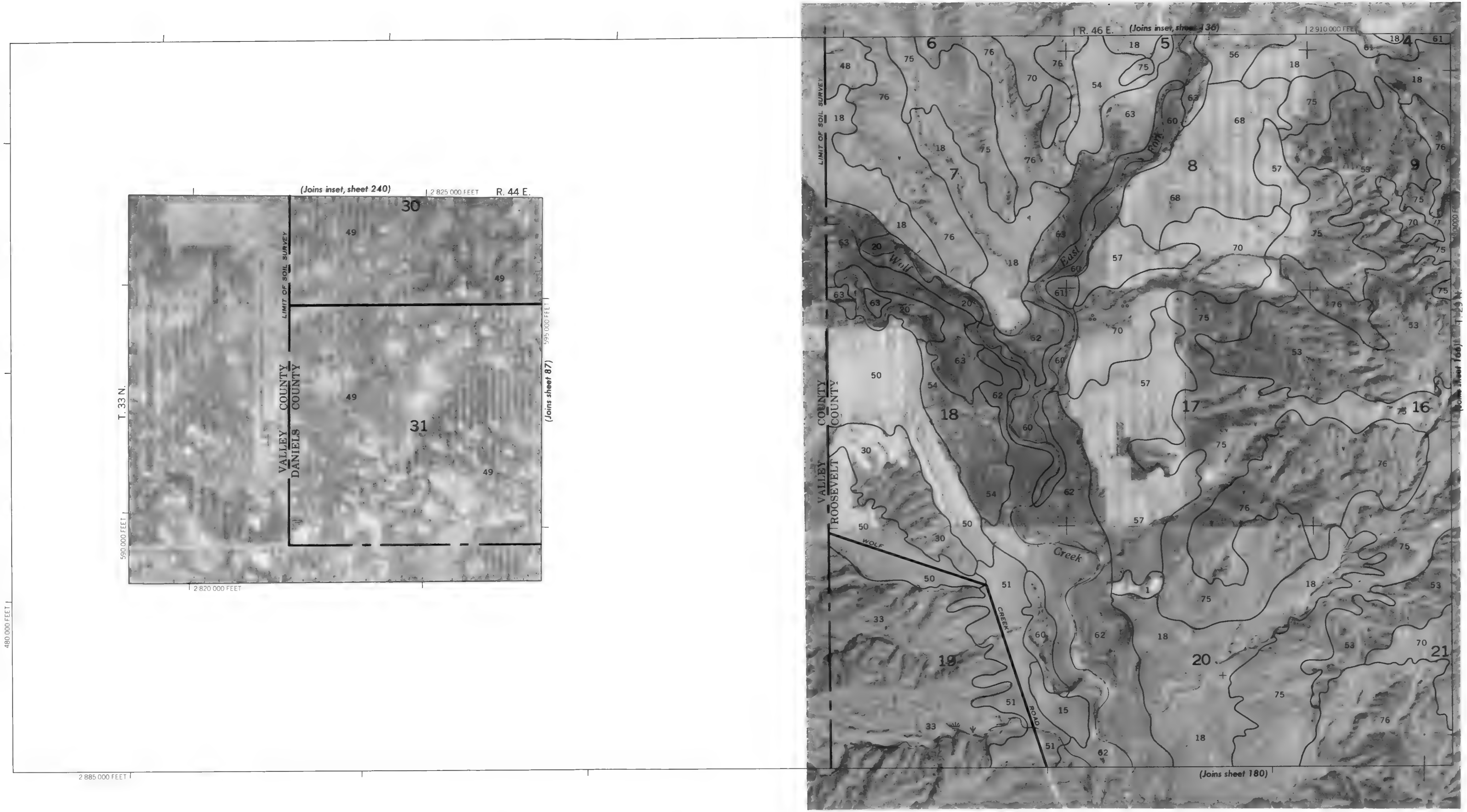
Coordinate grid ticks and land division corners, if shown, are approximately positioned

165

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 165

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.

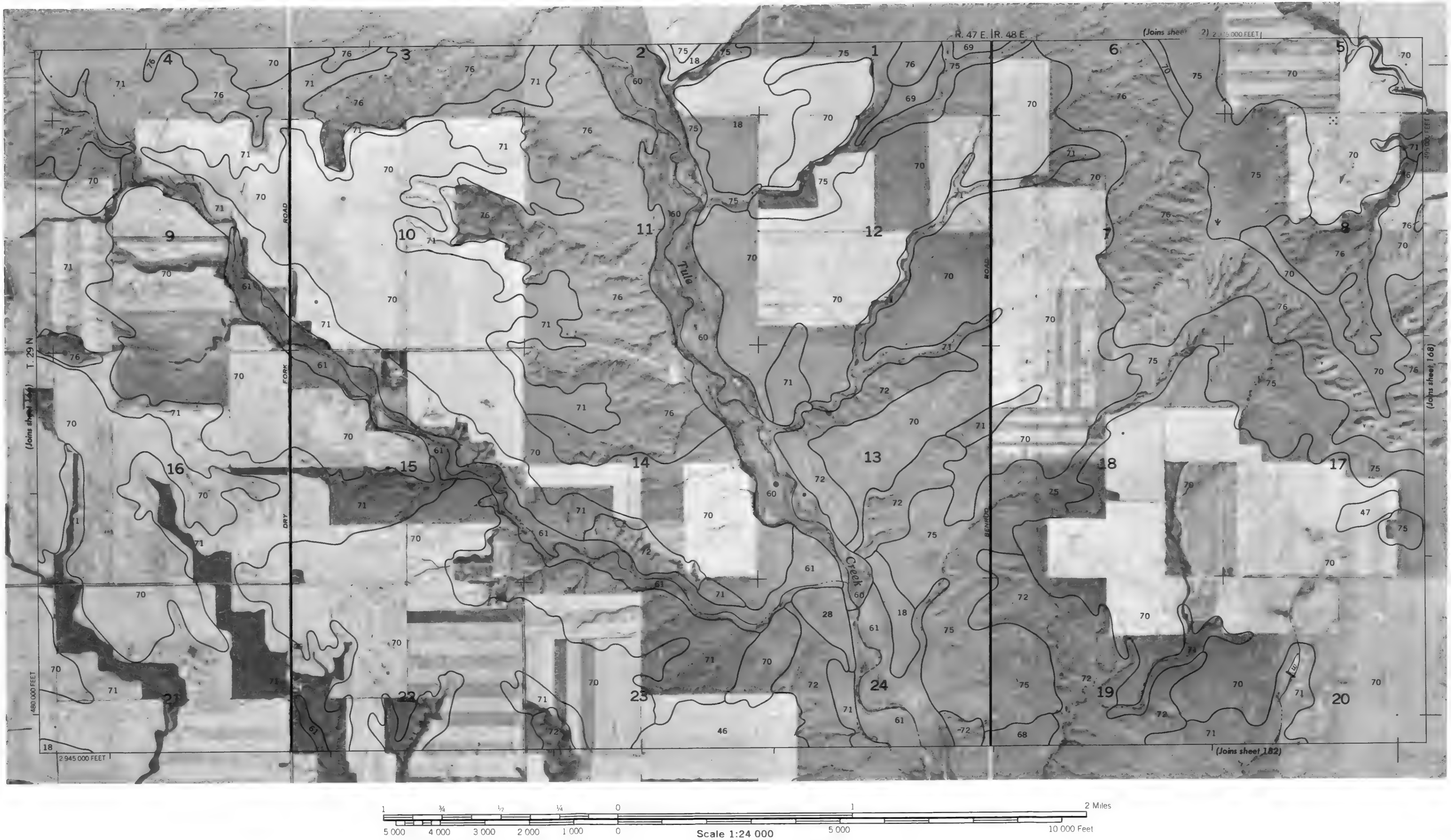
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

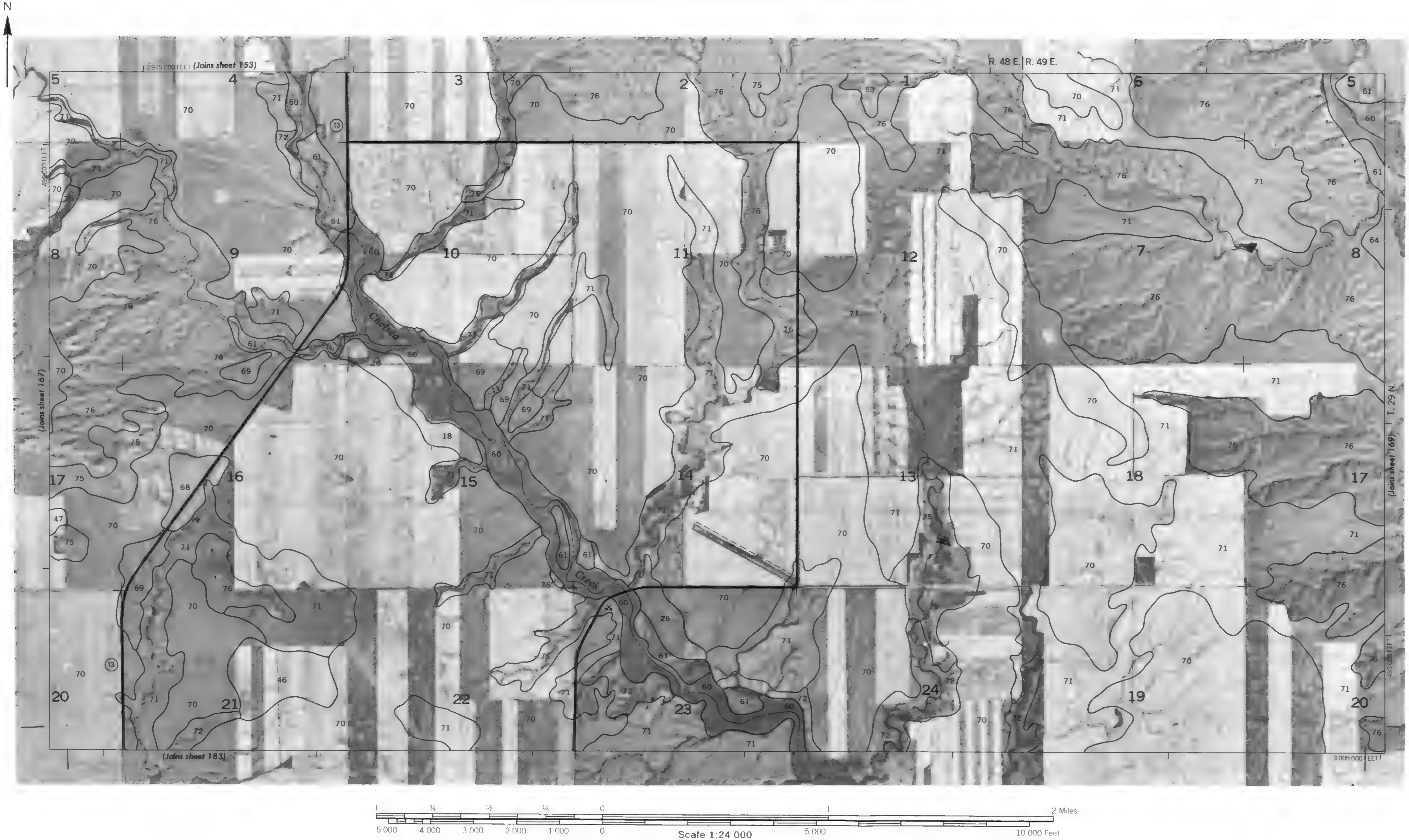
167

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 167

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

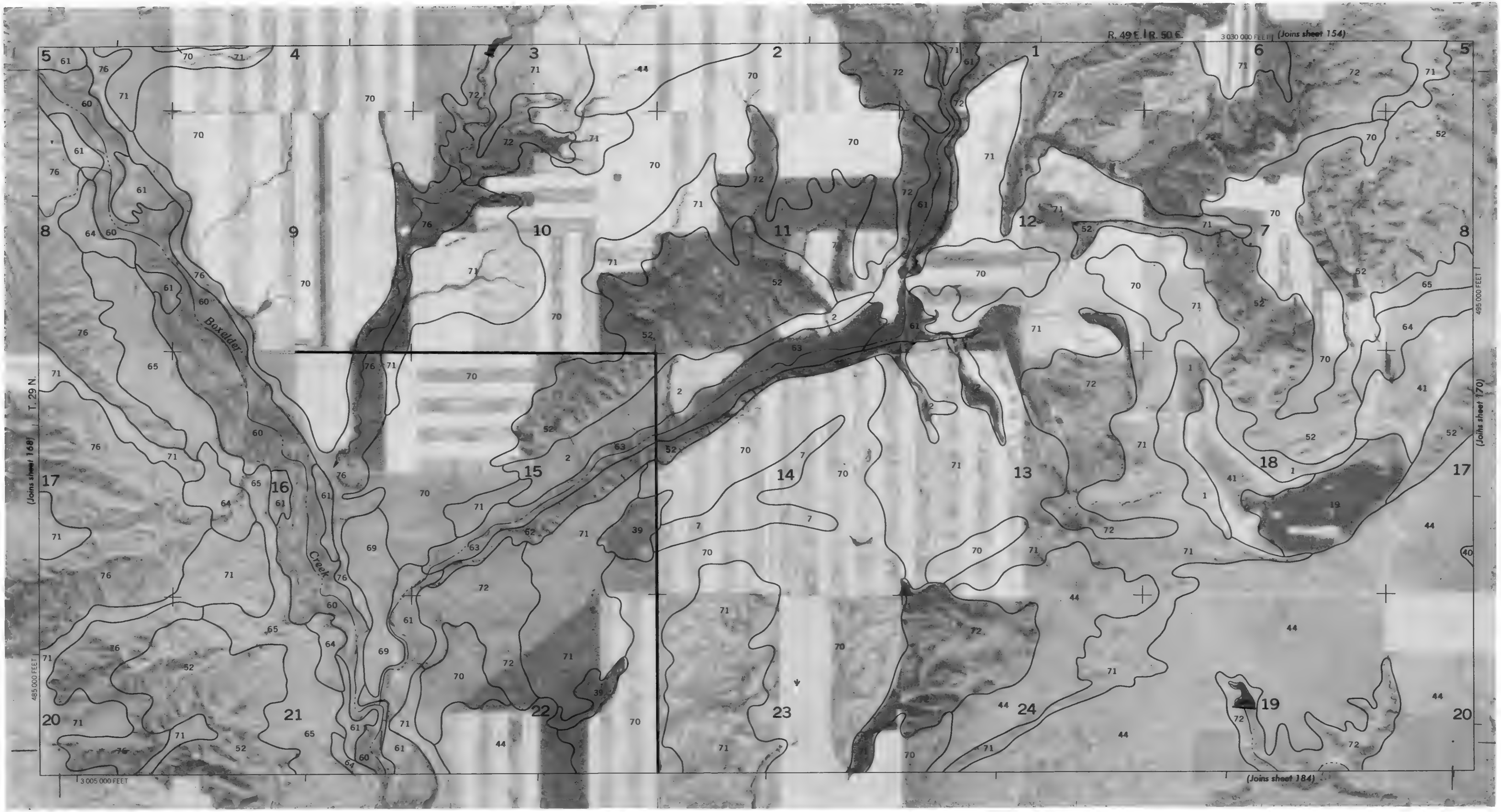




This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 168

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

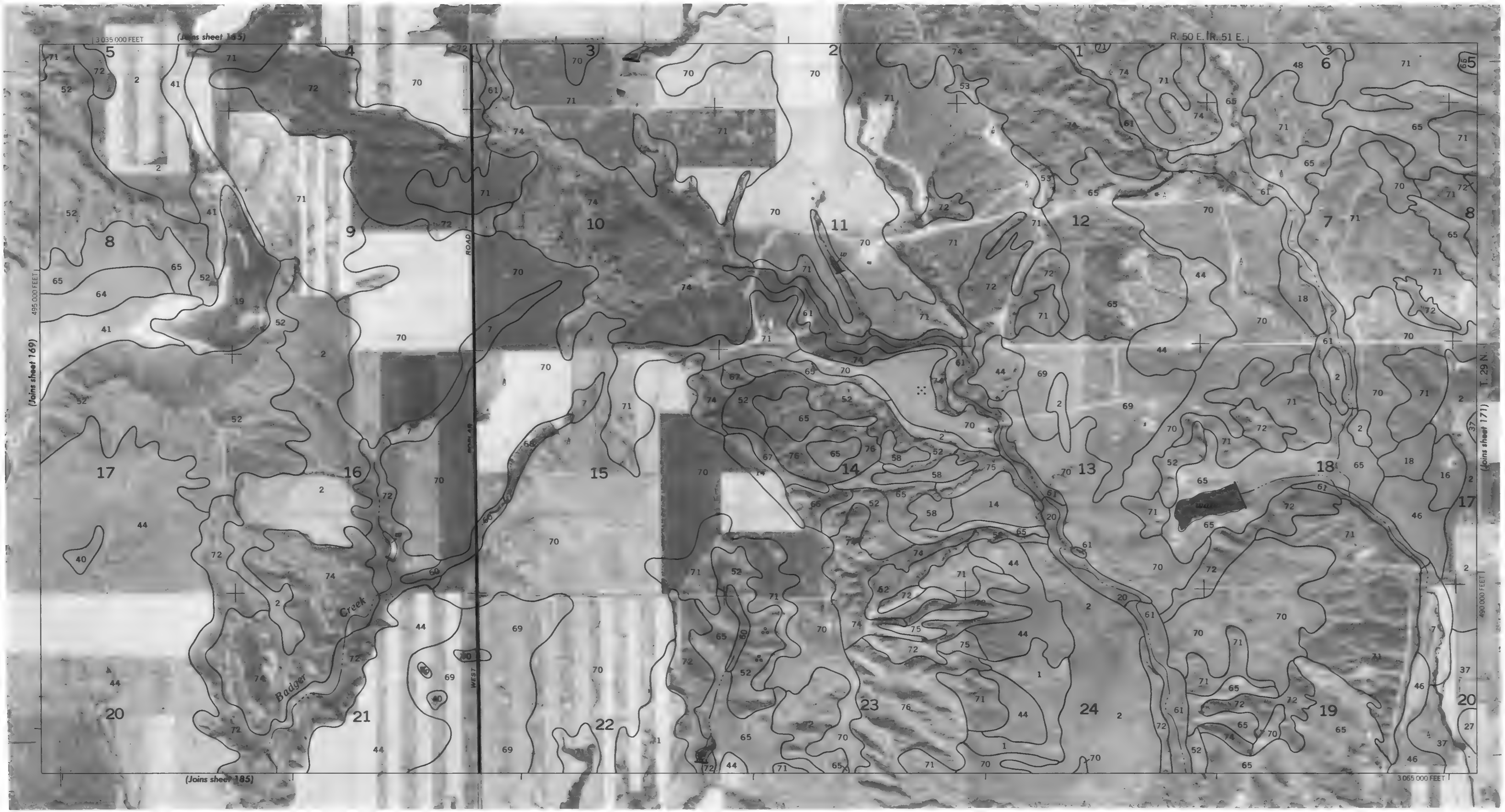
Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 169

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 170

N



1 ¾ ½ ¼ 0 1 2 Miles

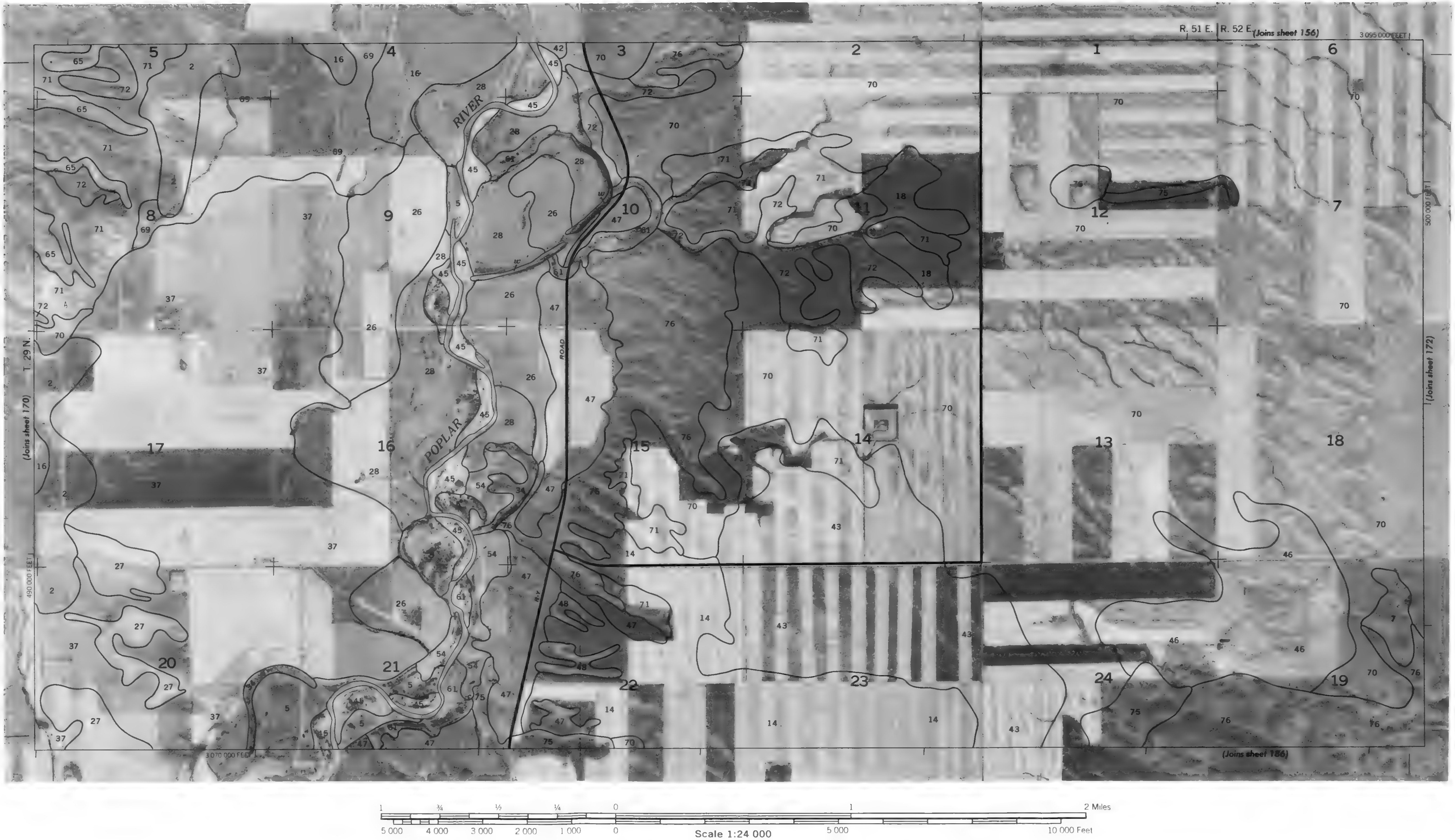
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 170

N

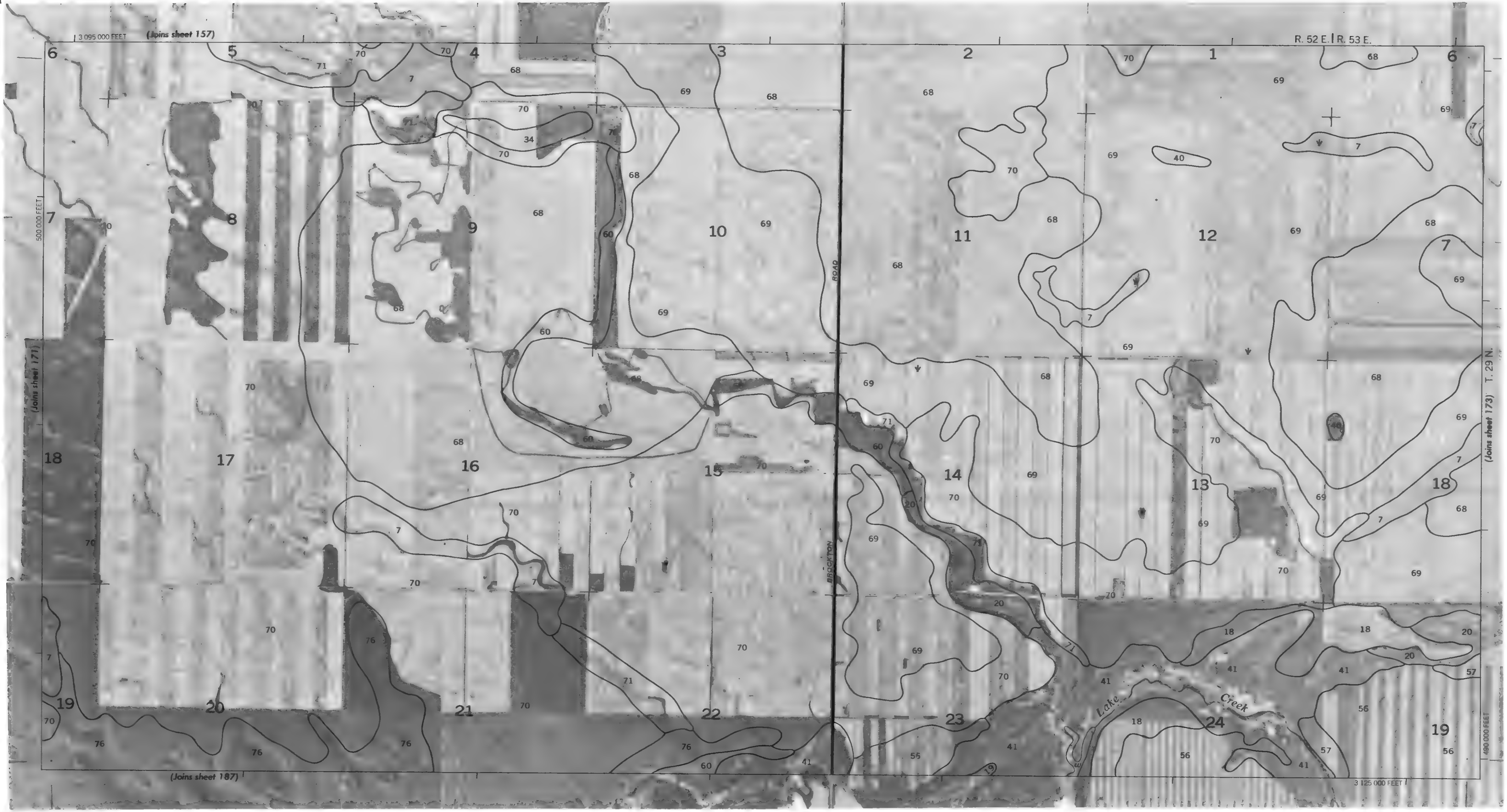


ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 171

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 172

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 172

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 173

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 174

N

Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 174

175

N

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

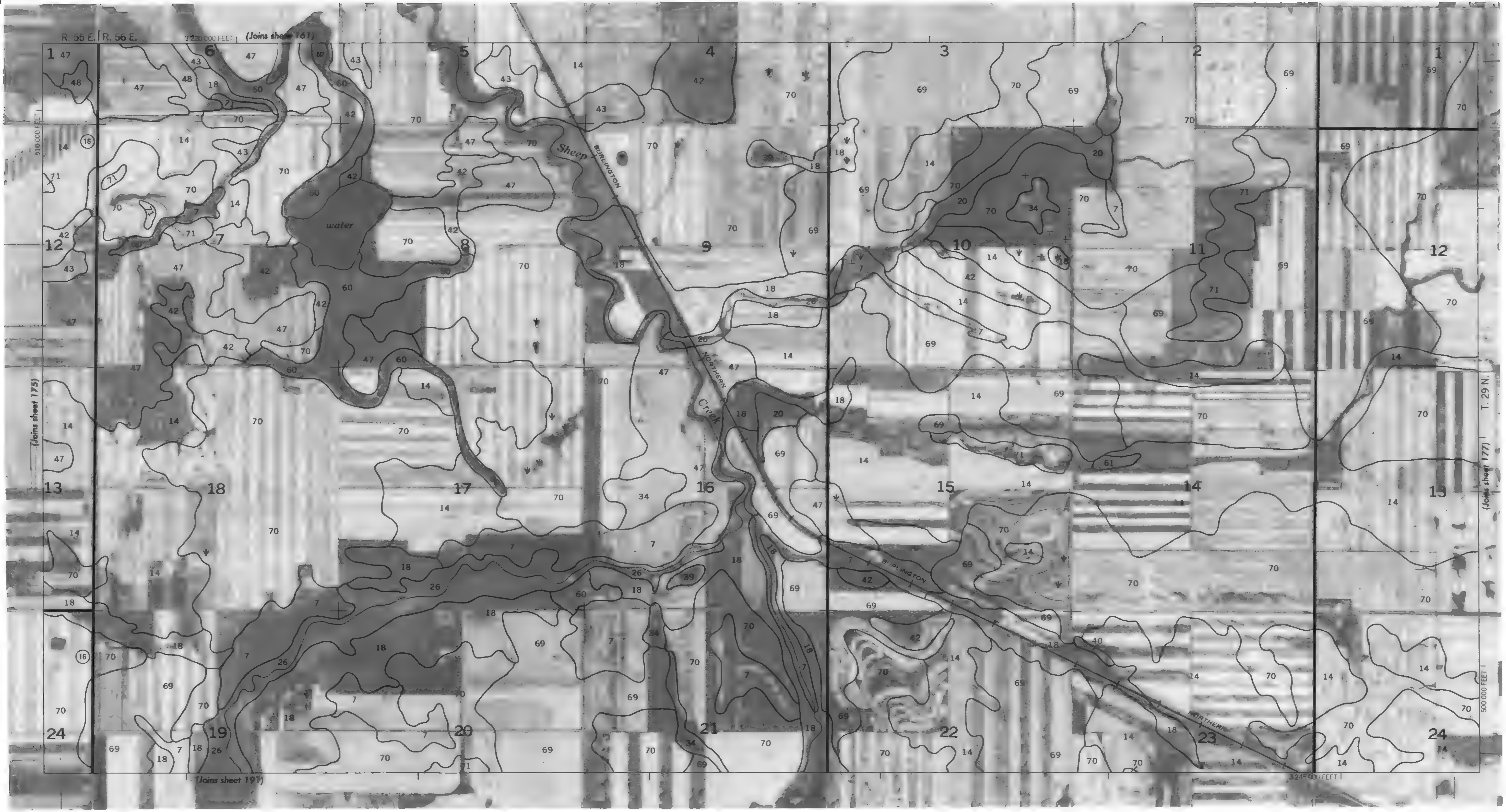
Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 175

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

176

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

N

1 ¾ ½ ¼ 0 1 2 Miles

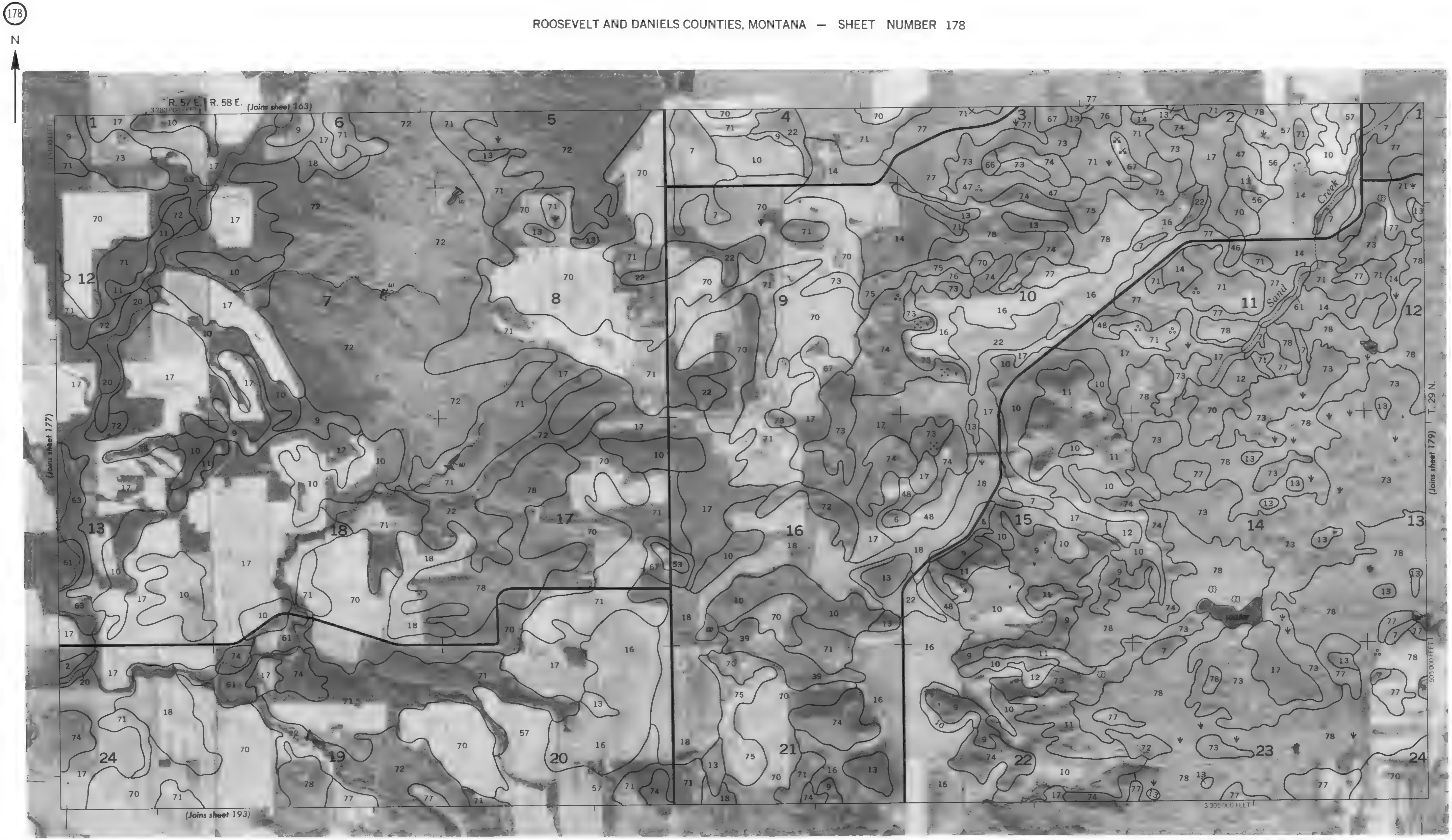
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 177

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 178



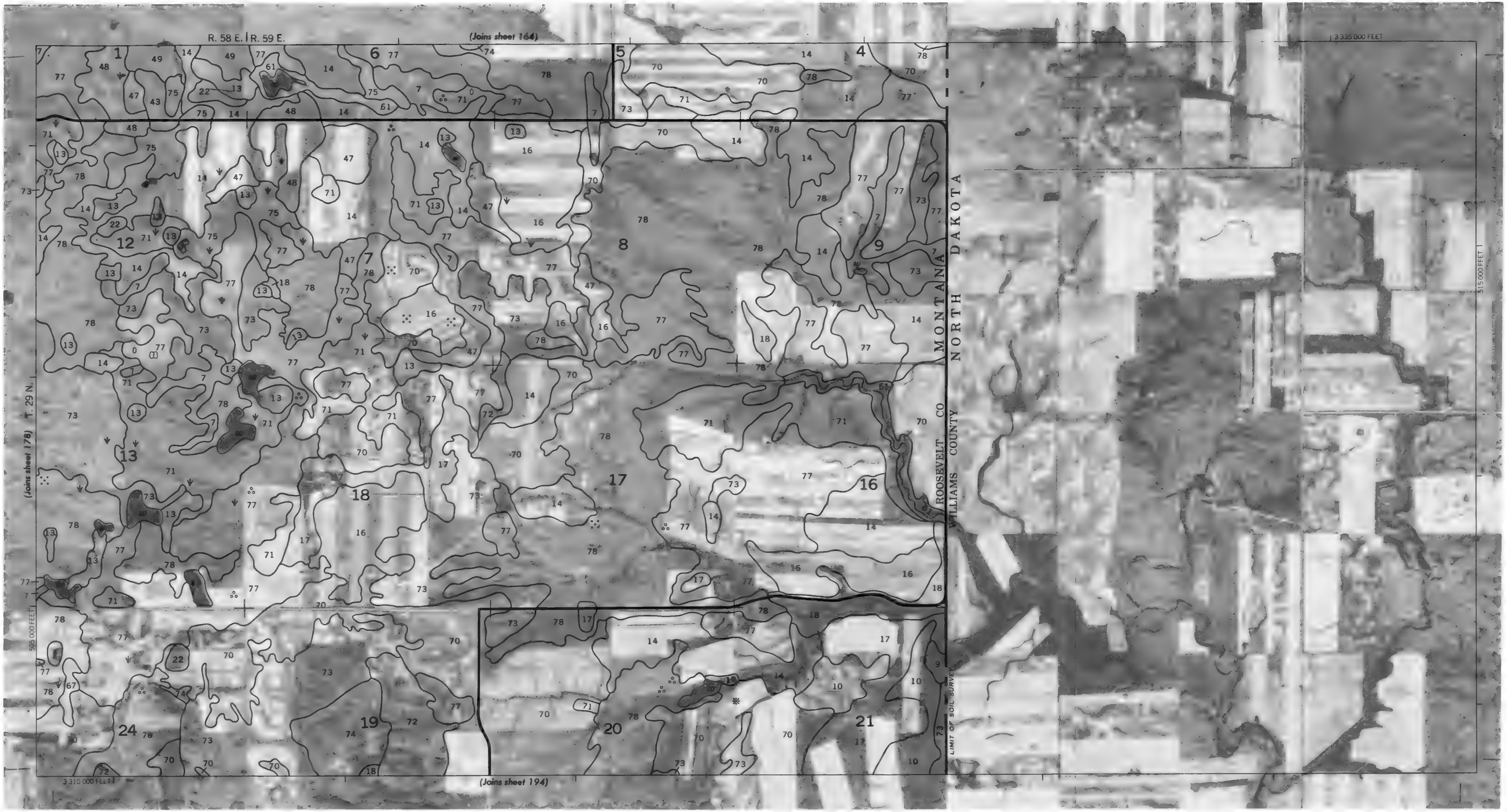
1 ¾ ½ ¼ 0 1 2 Miles
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet
Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 179

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

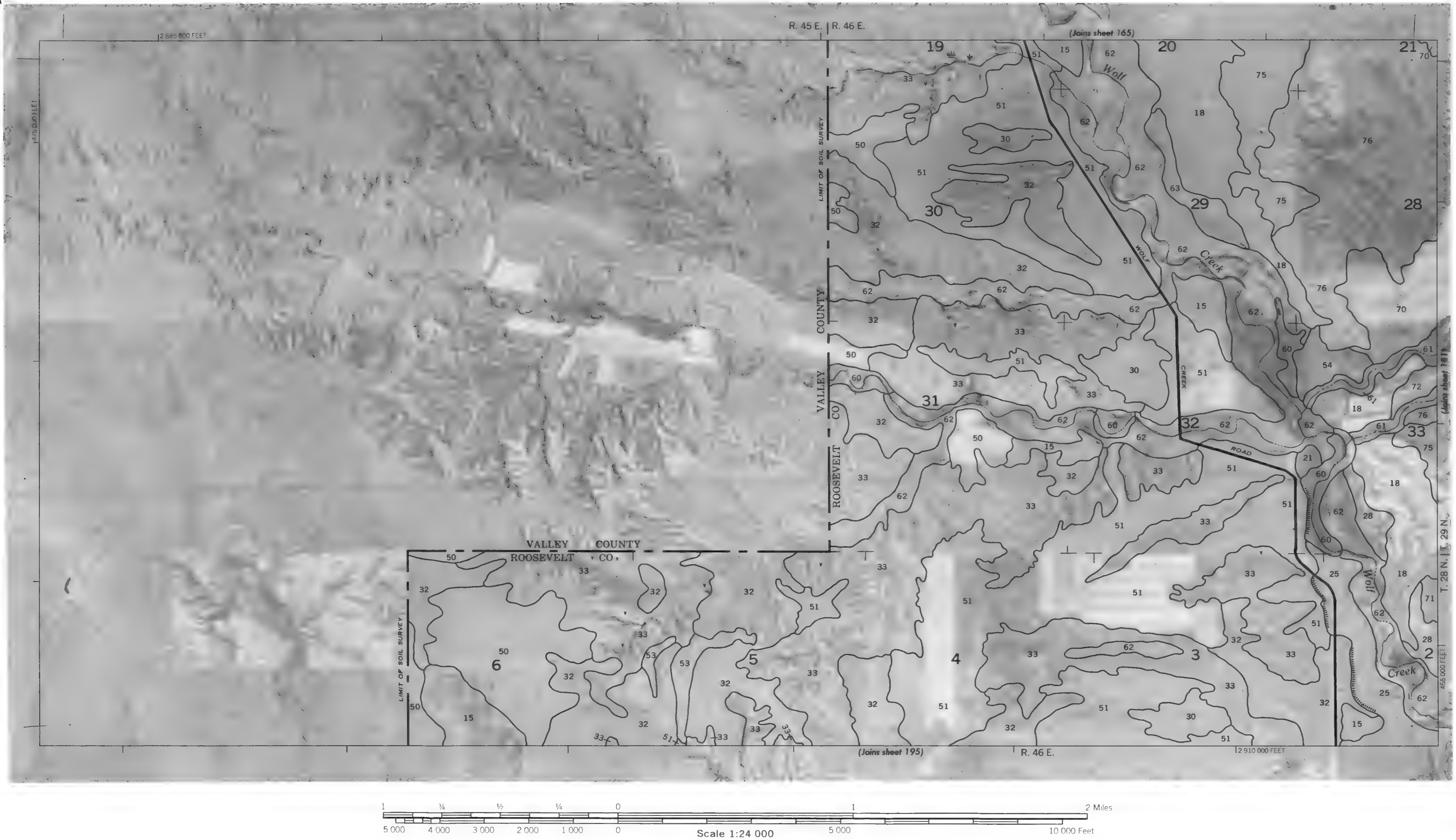


1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

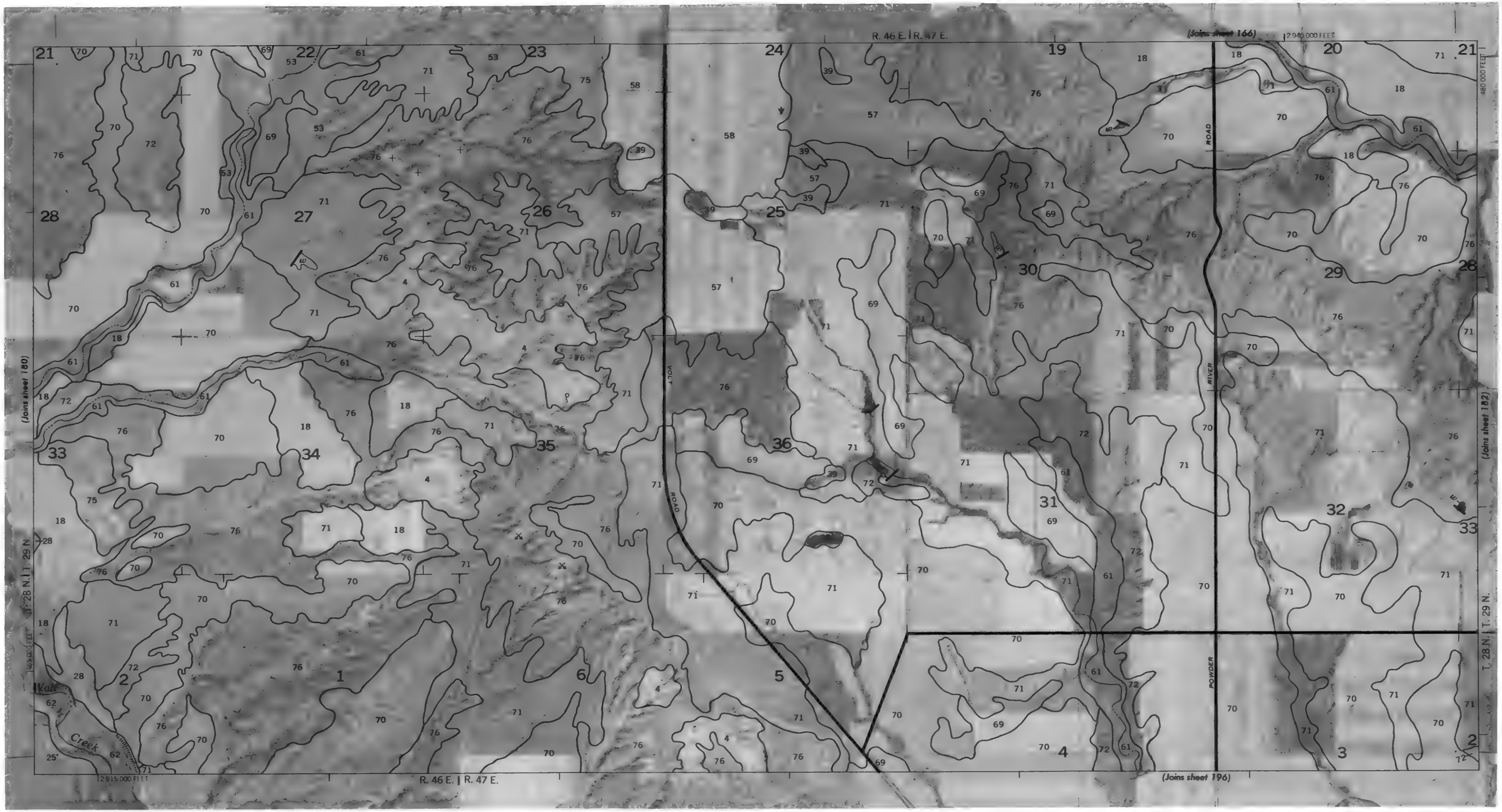
Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 180



Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N



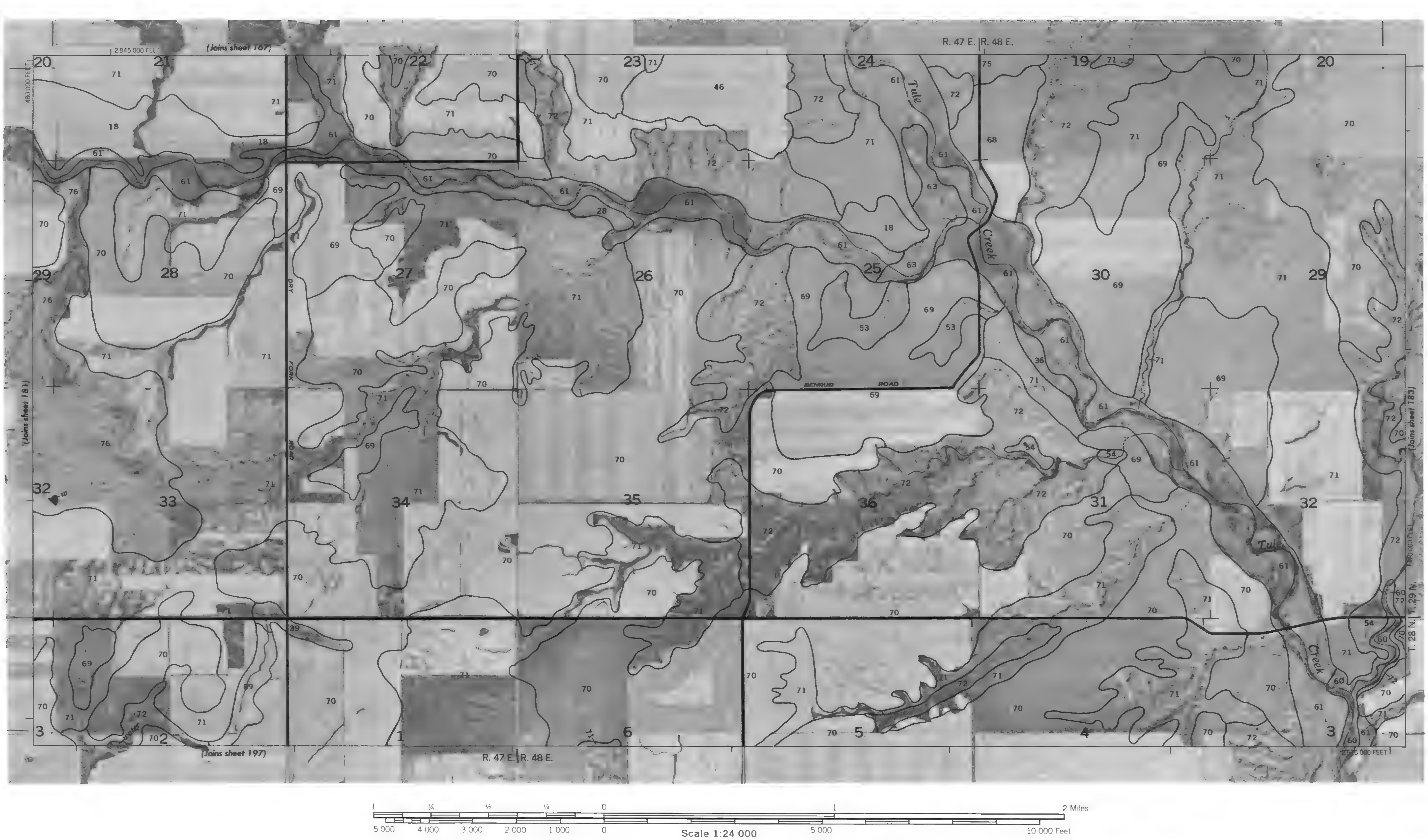
1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 182

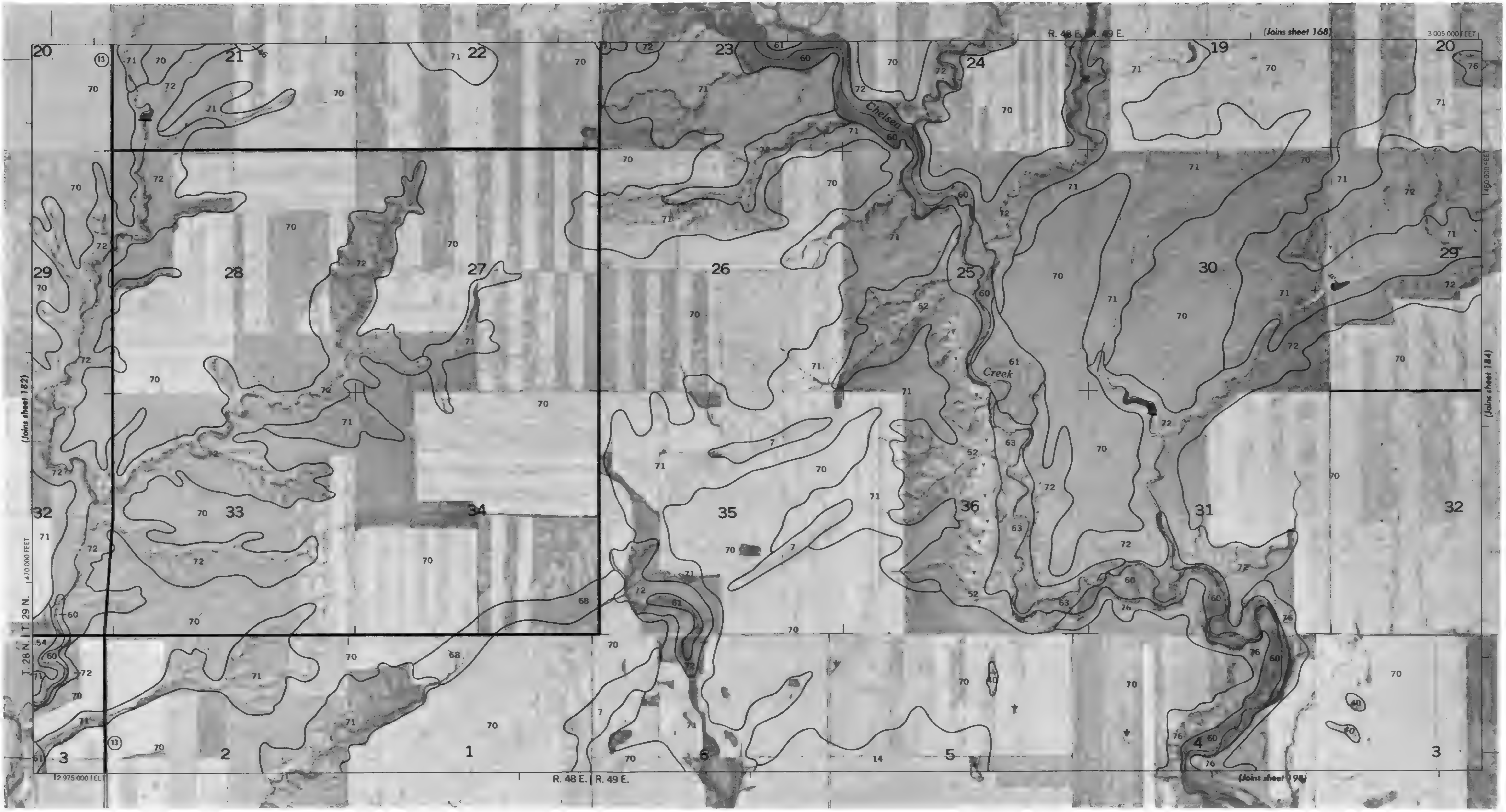


This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

Coordinate grid ticks and land division corners, if shown, are approximately positioned

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 182

N



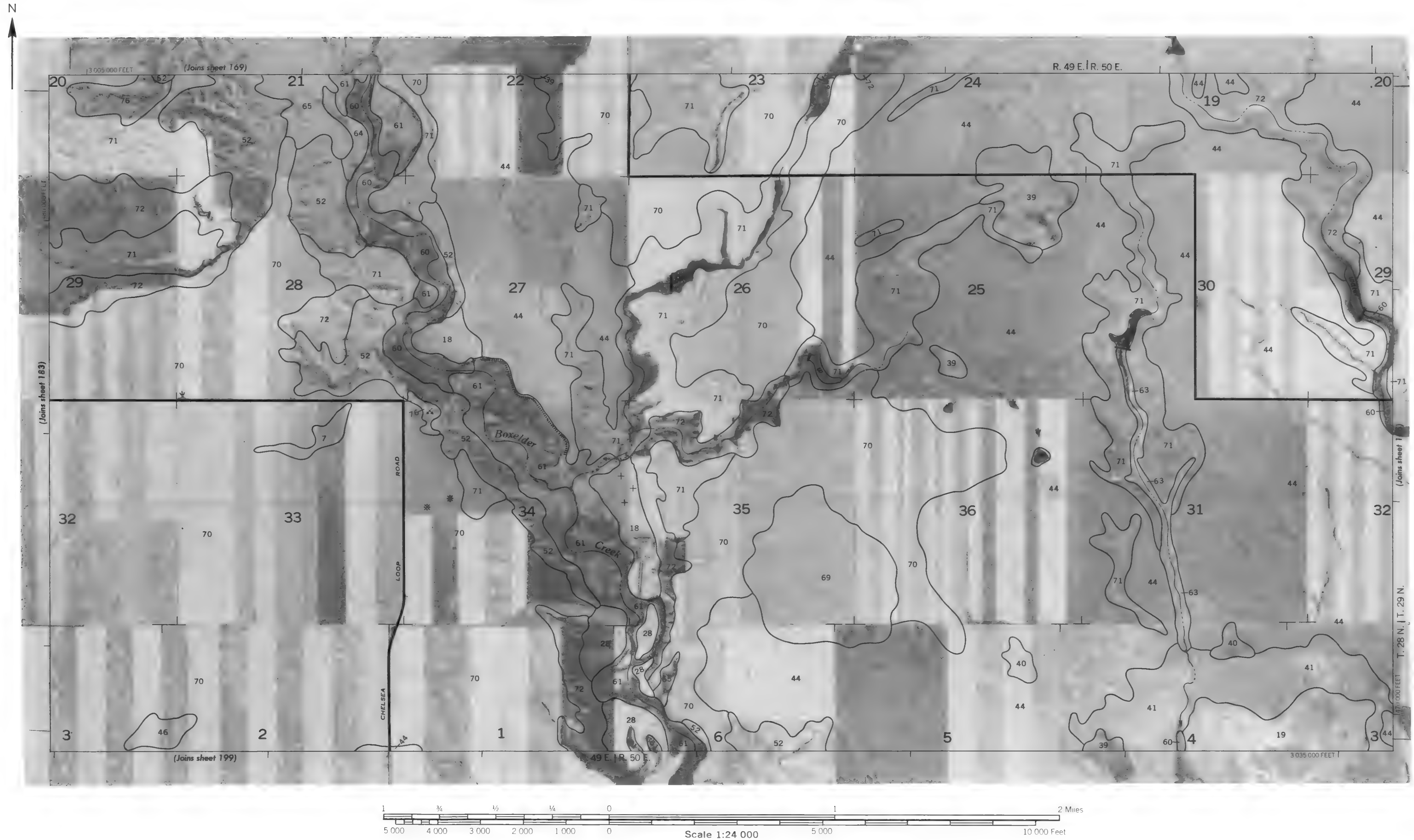
1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 183

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



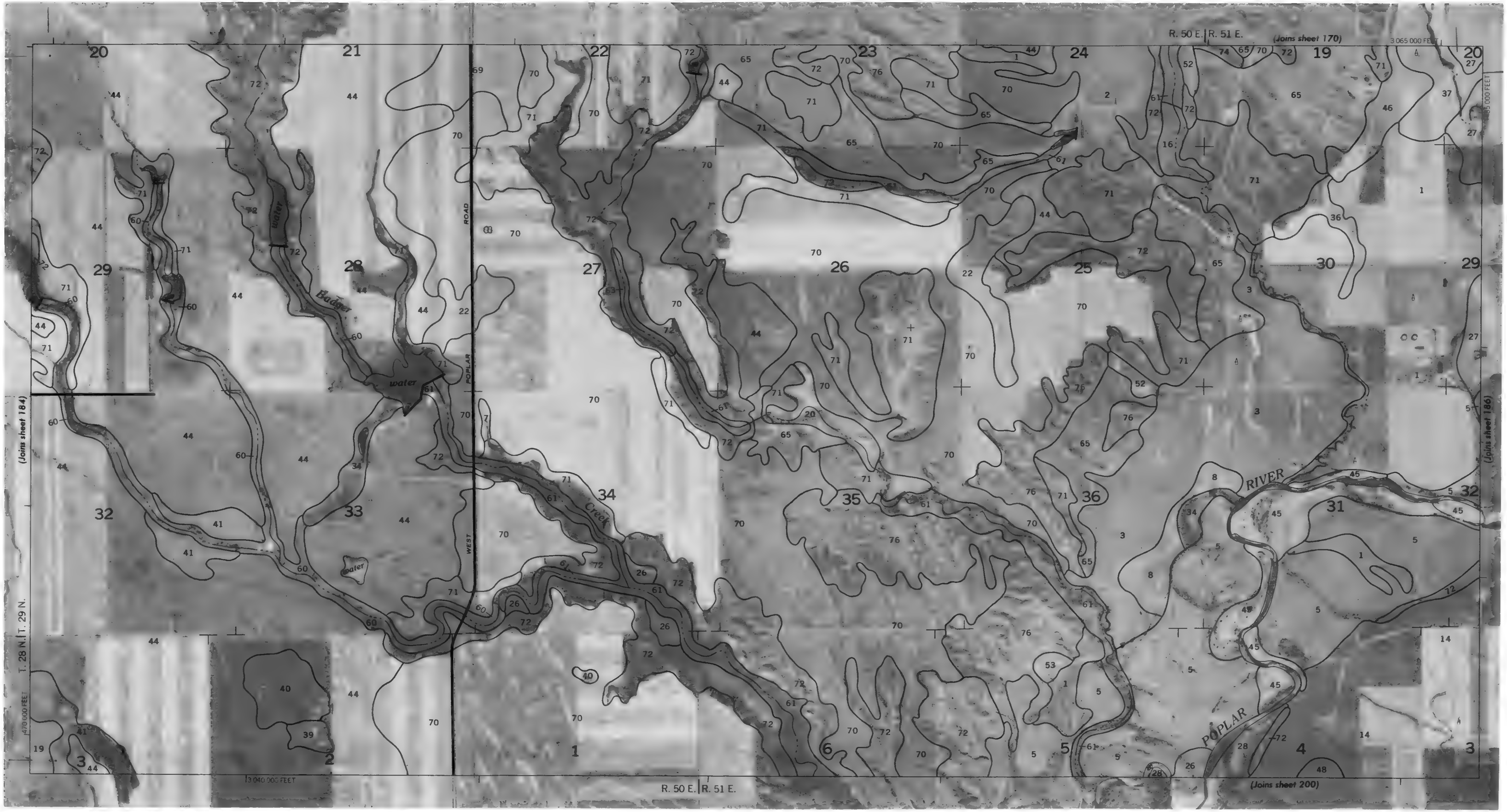
Coordinate grid ticks and land division corners, if shown, are approximately positioned

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 185

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

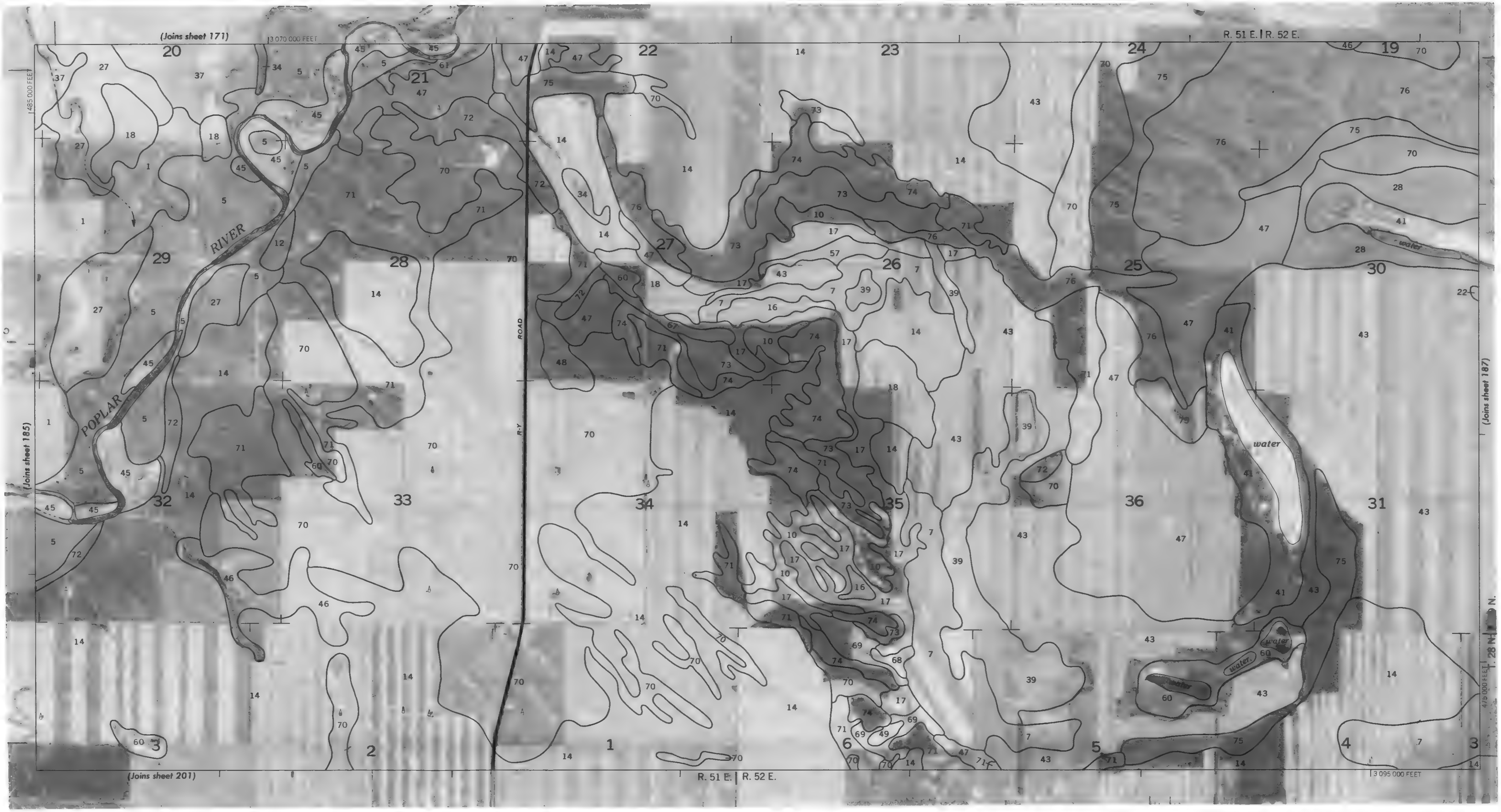


1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 186



1 ¾ ½ ¼ 0 1 2 Miles
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet
Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

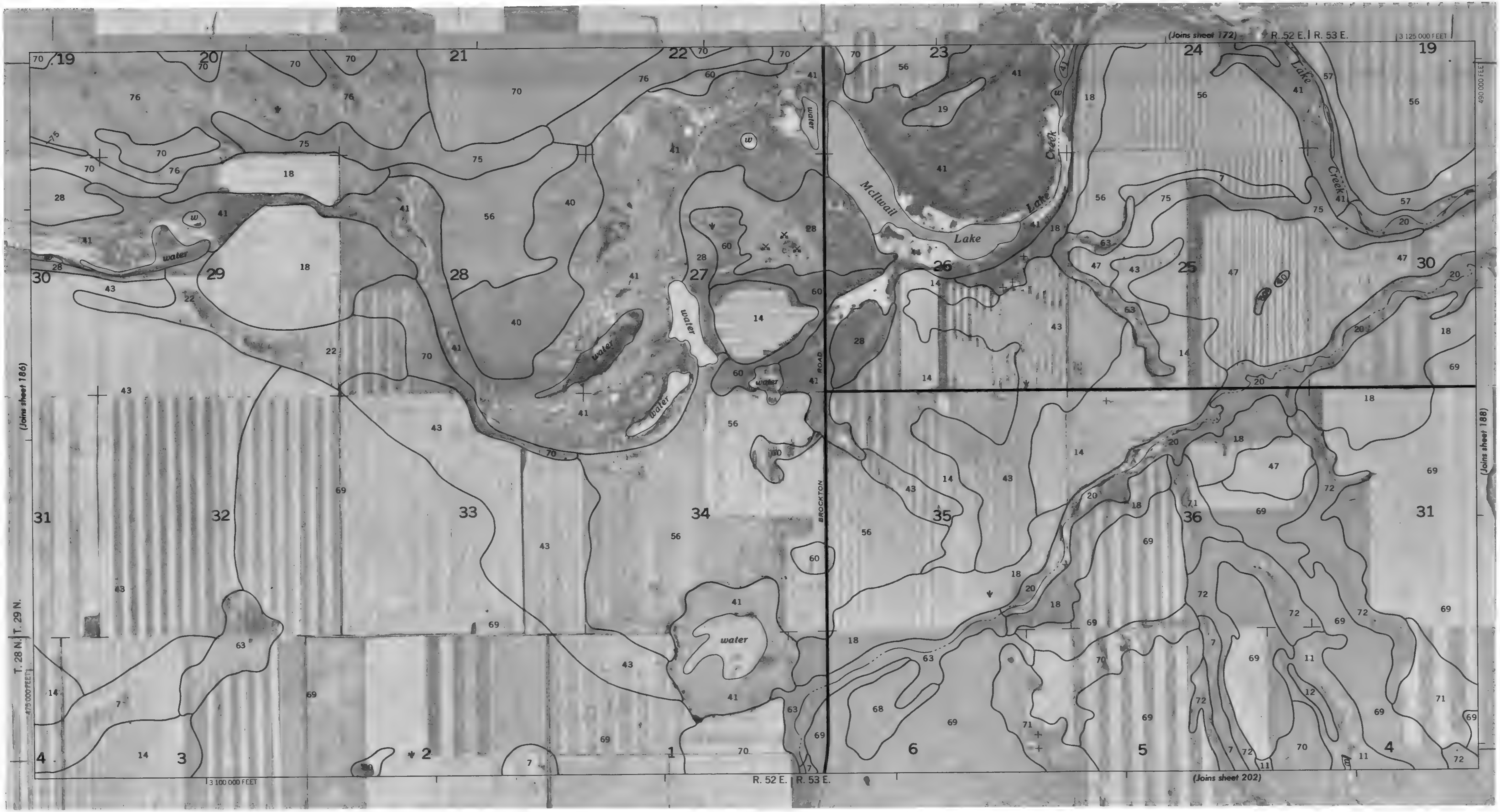
ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 186

187

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 187

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

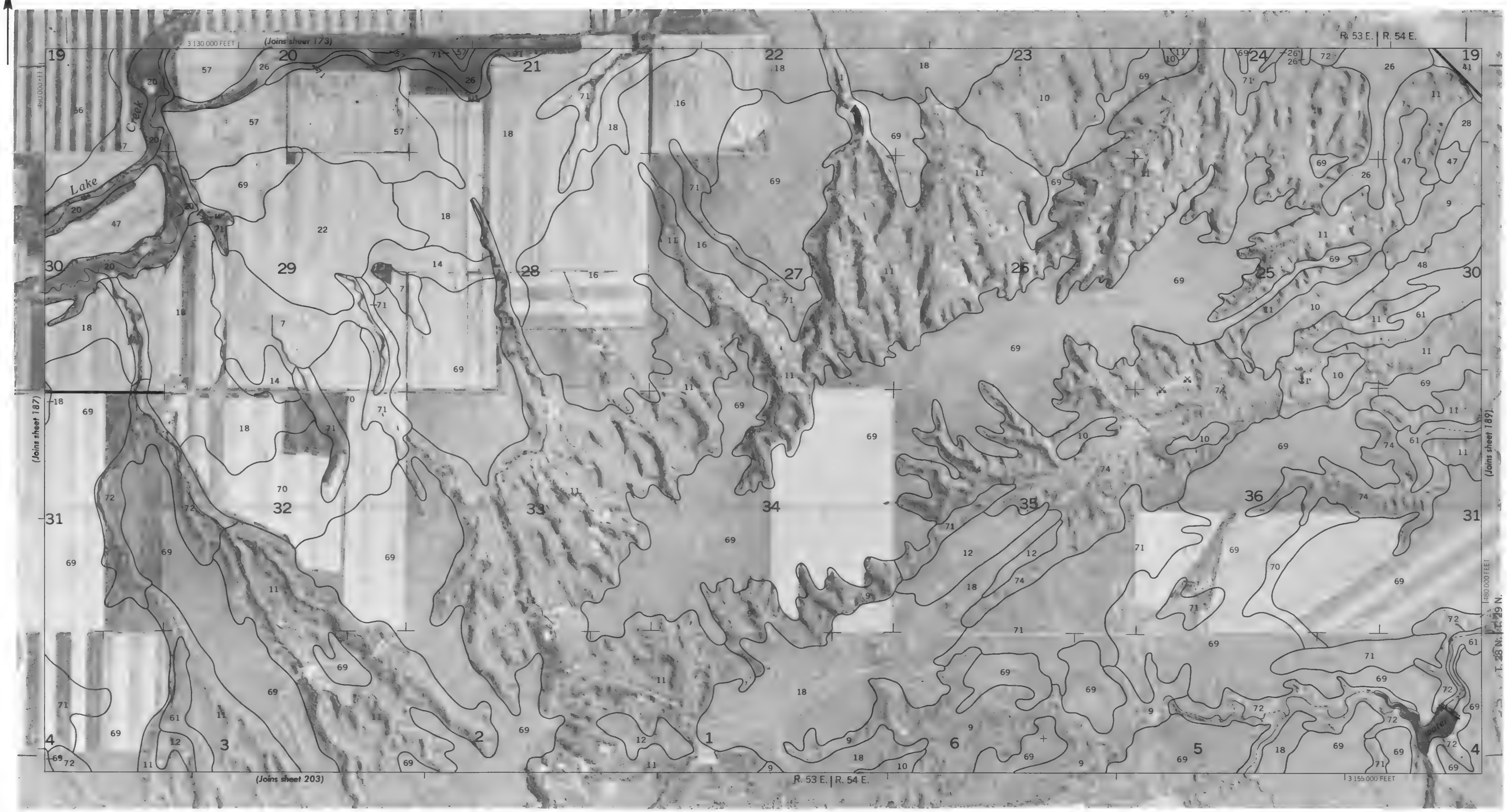


1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

189

N

1 ¾ ½ ¼ 0 1 2 Miles

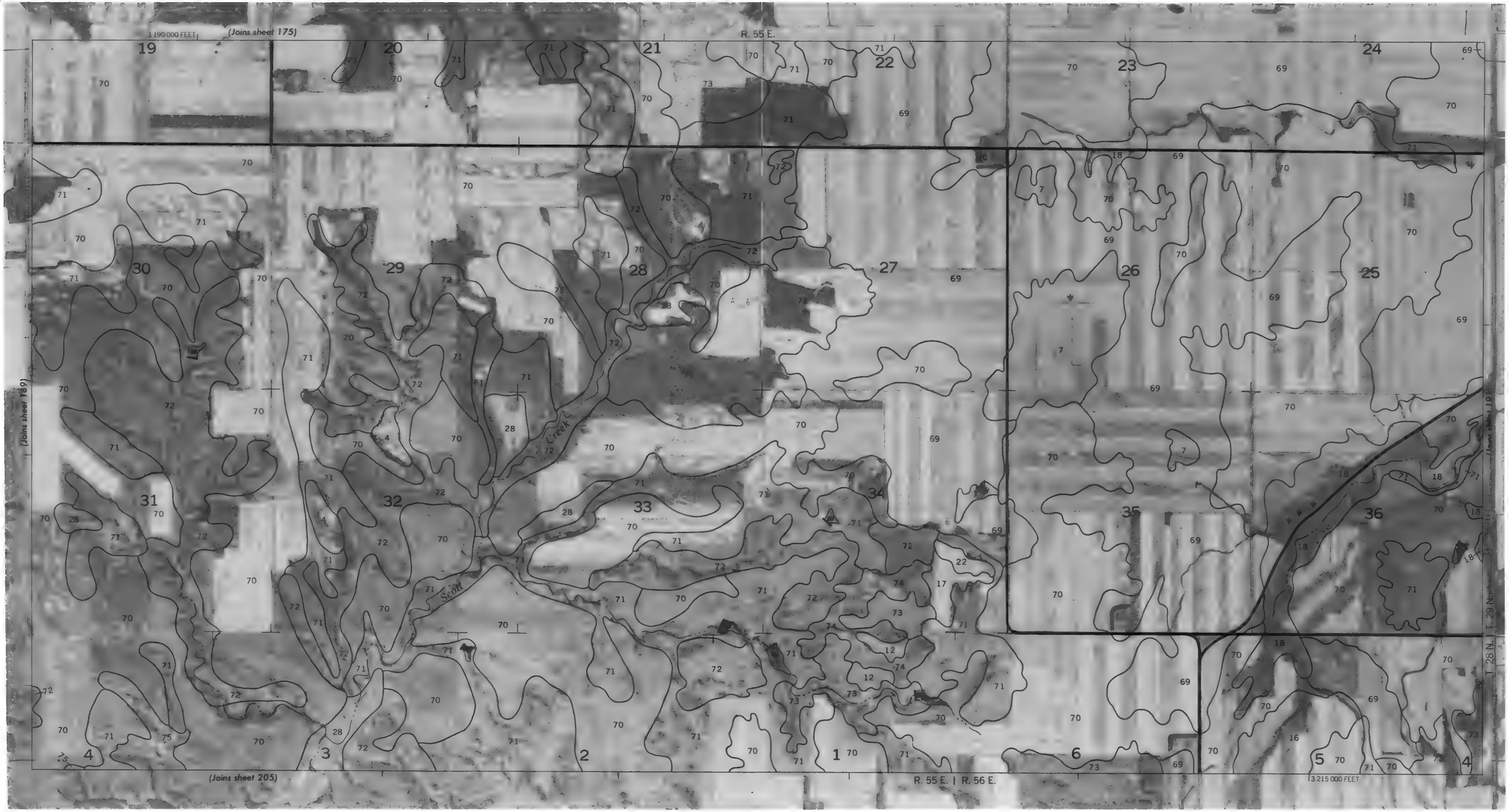
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 189

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

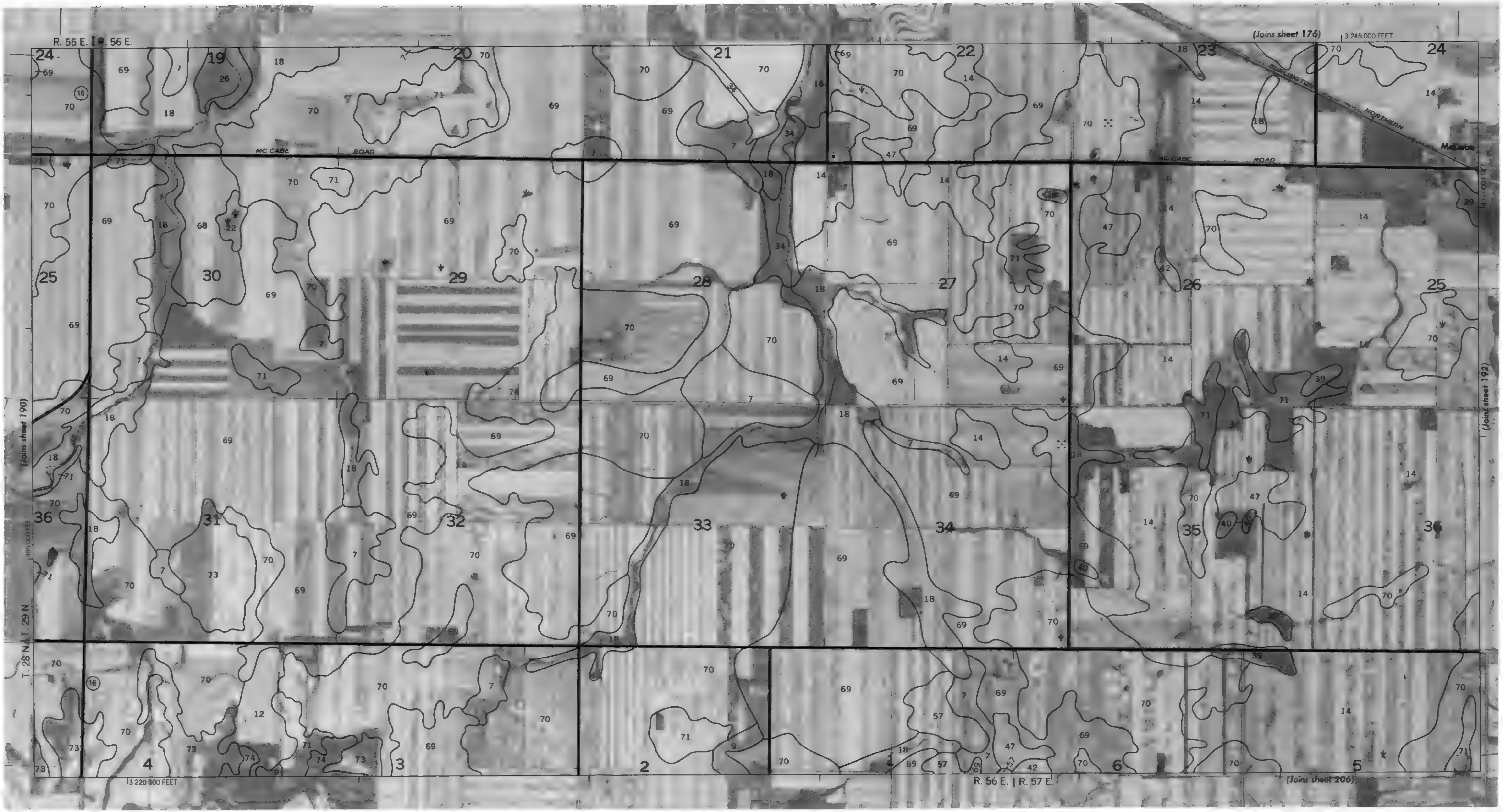
Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

191

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 191

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 192

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 192

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 193

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

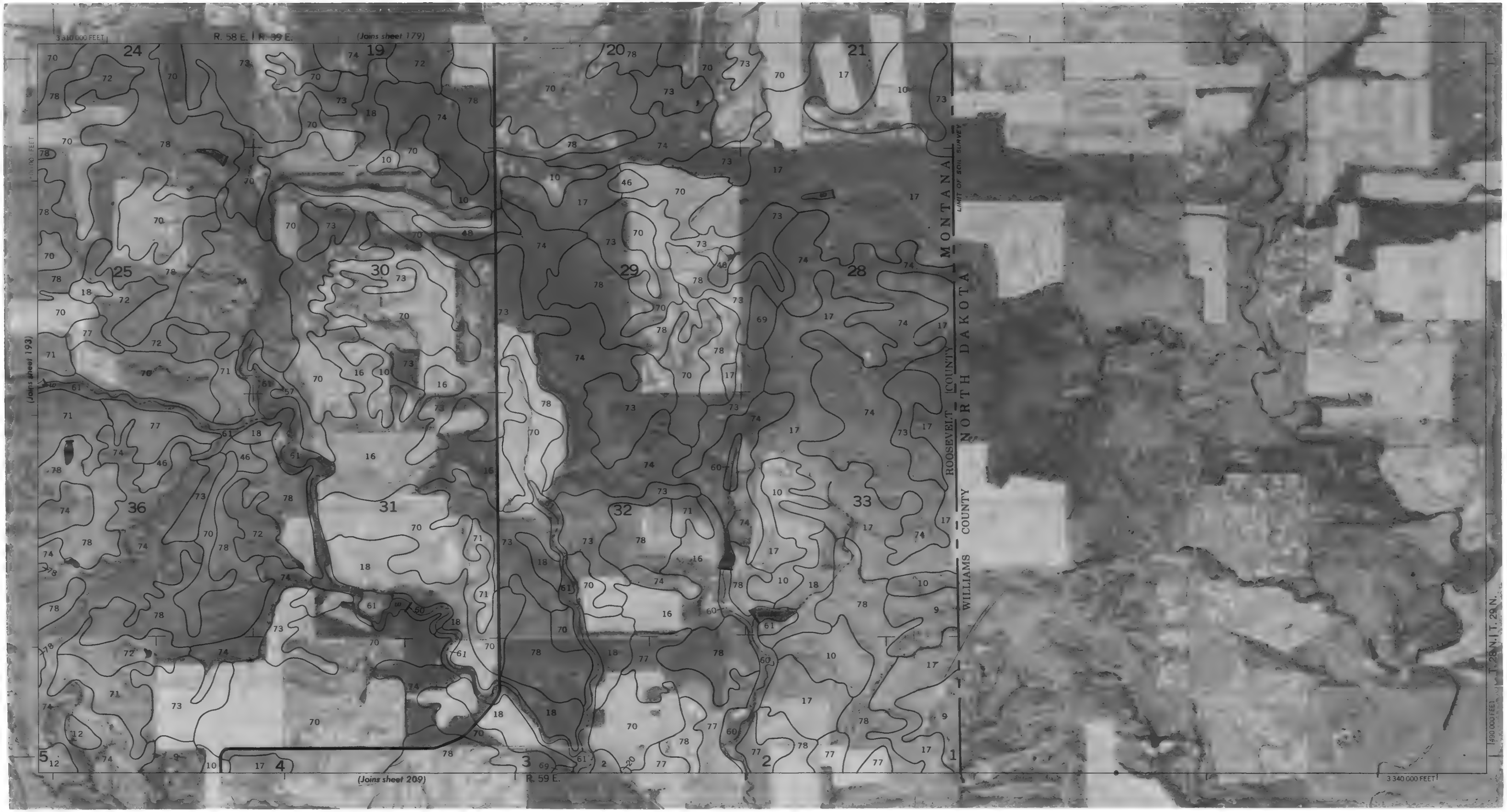
1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 194



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

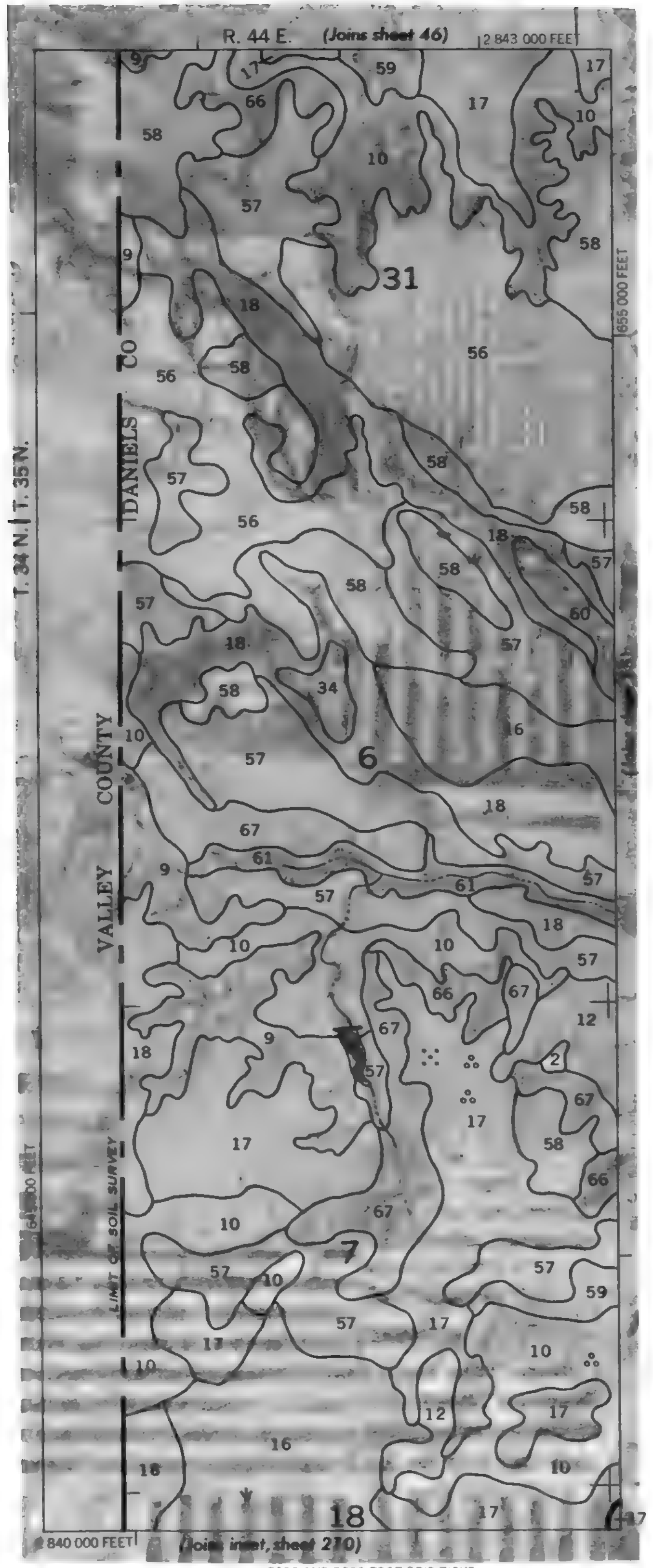
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

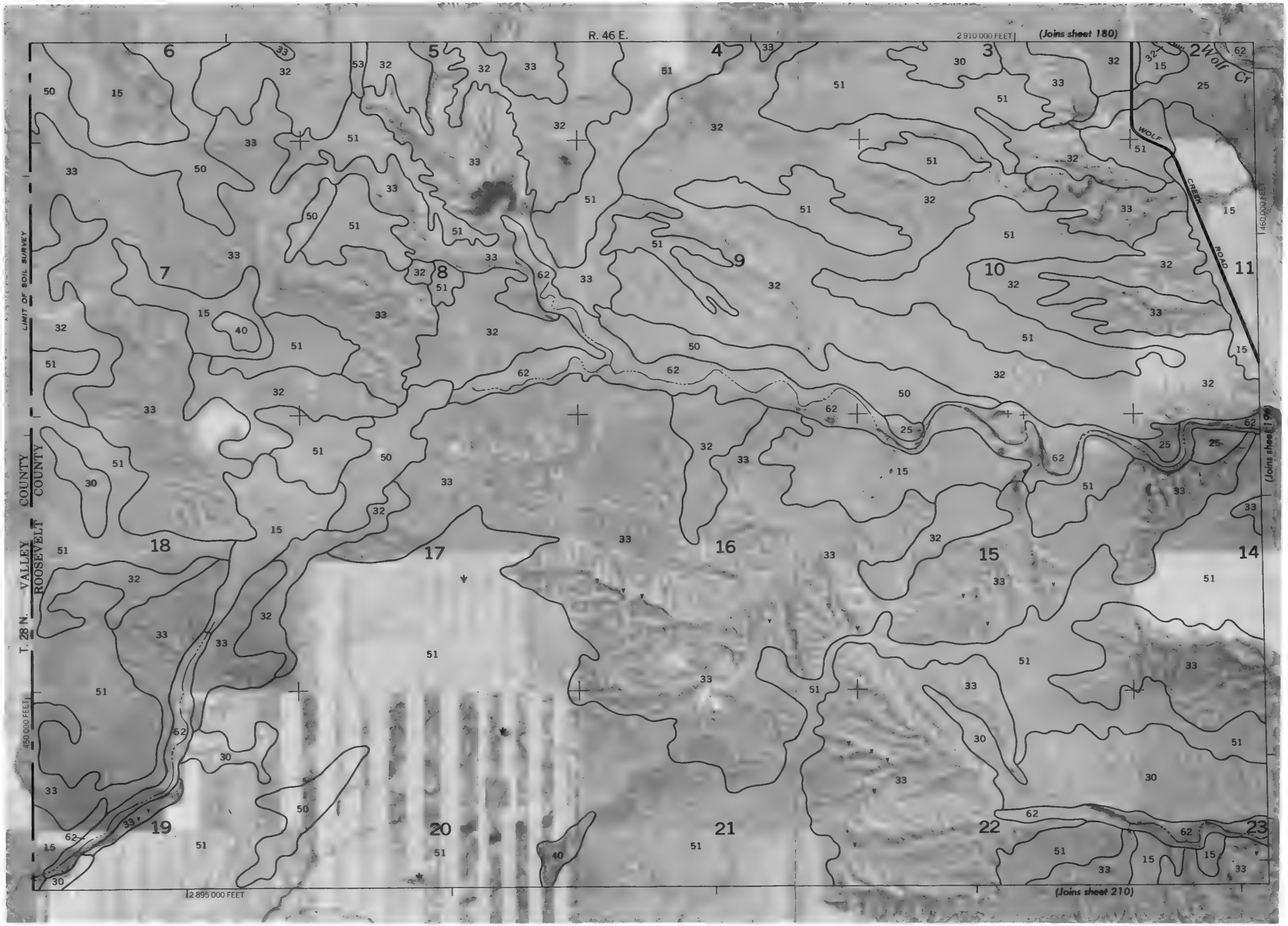
N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 195

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



3000 AND 5000-FOOT GRID TICKS



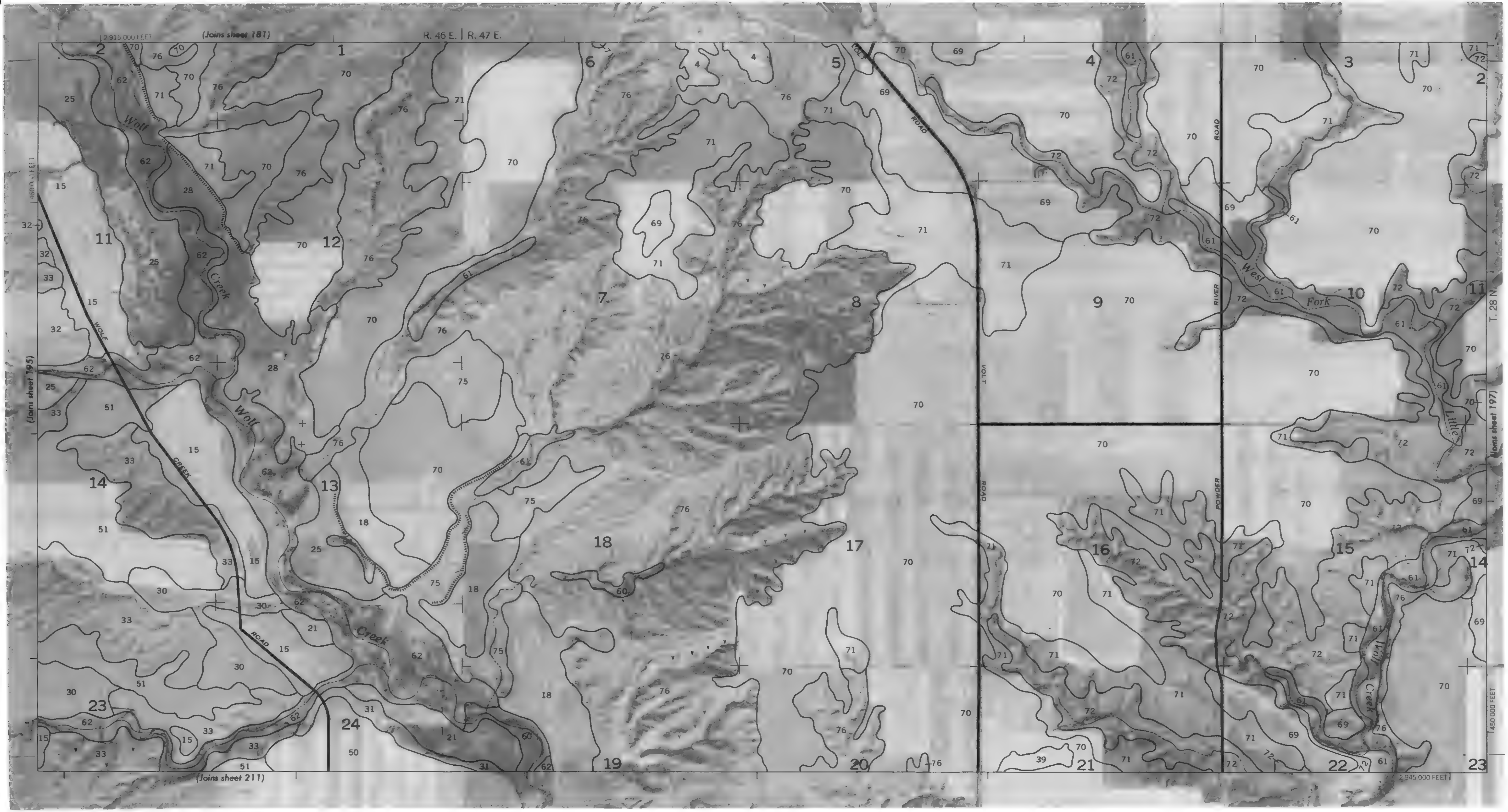
1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 196

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

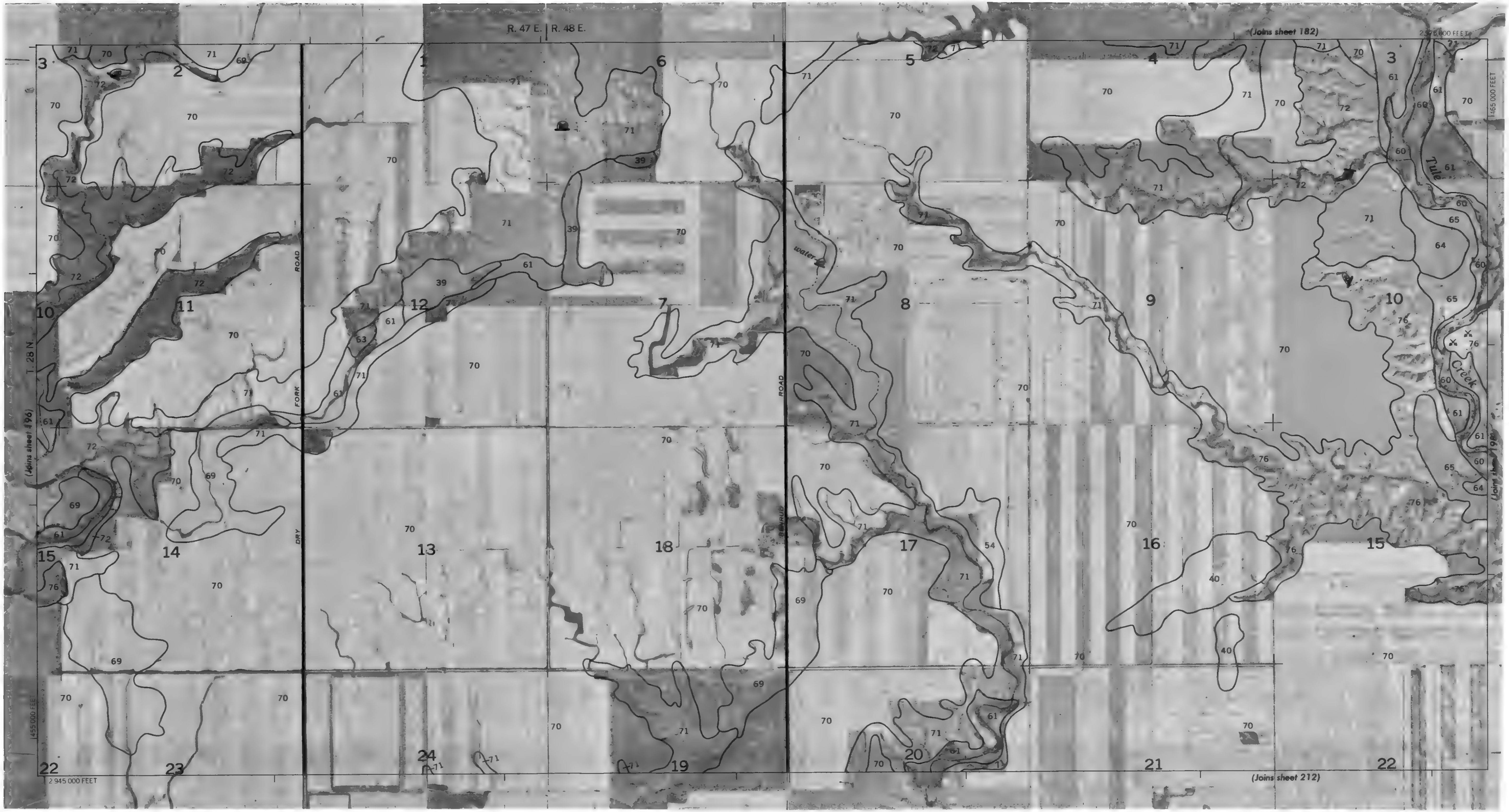
Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

197

N



1 ¾ ½ ¼ 0 1 2 Miles

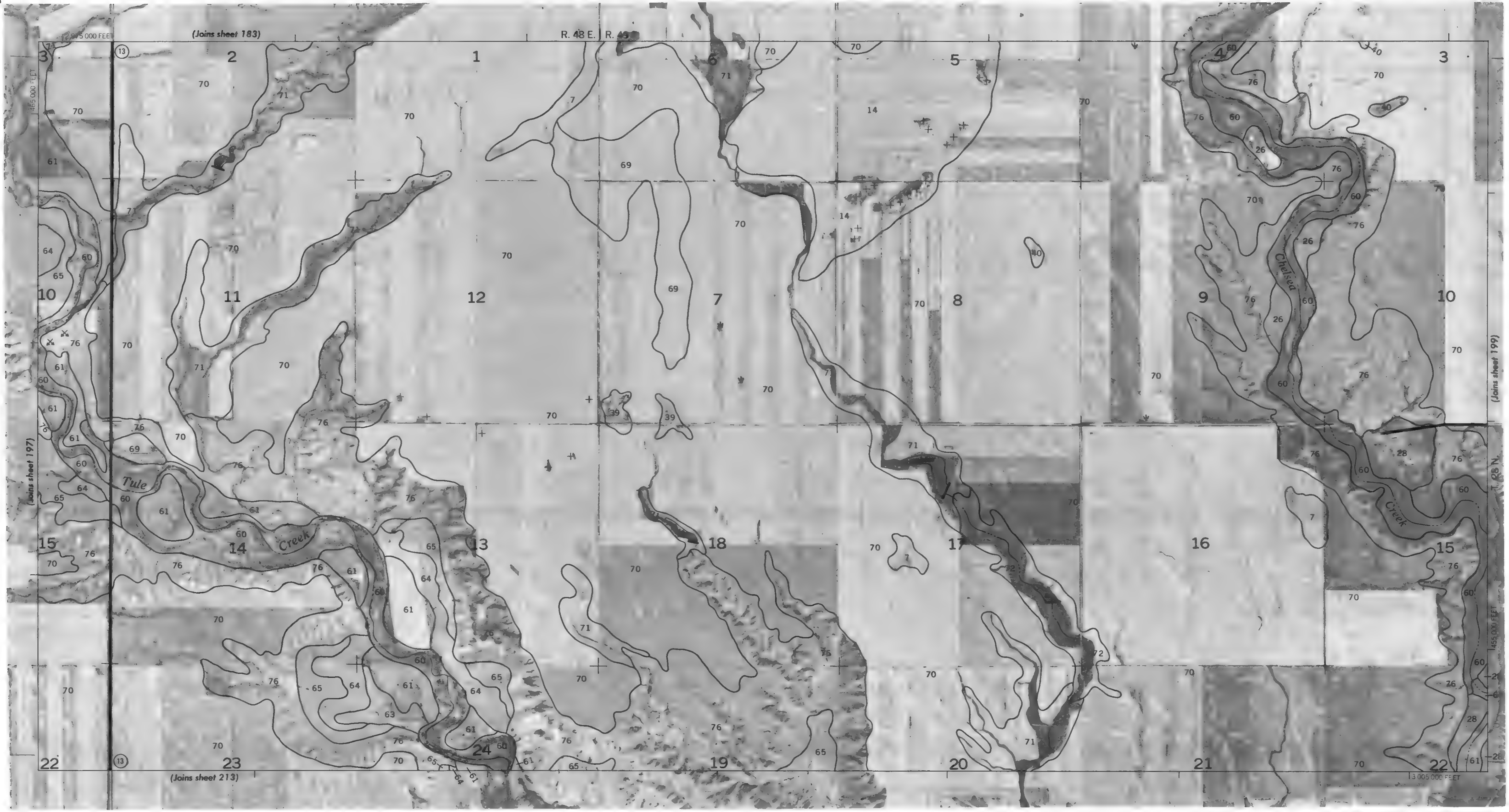
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 197

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 198



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

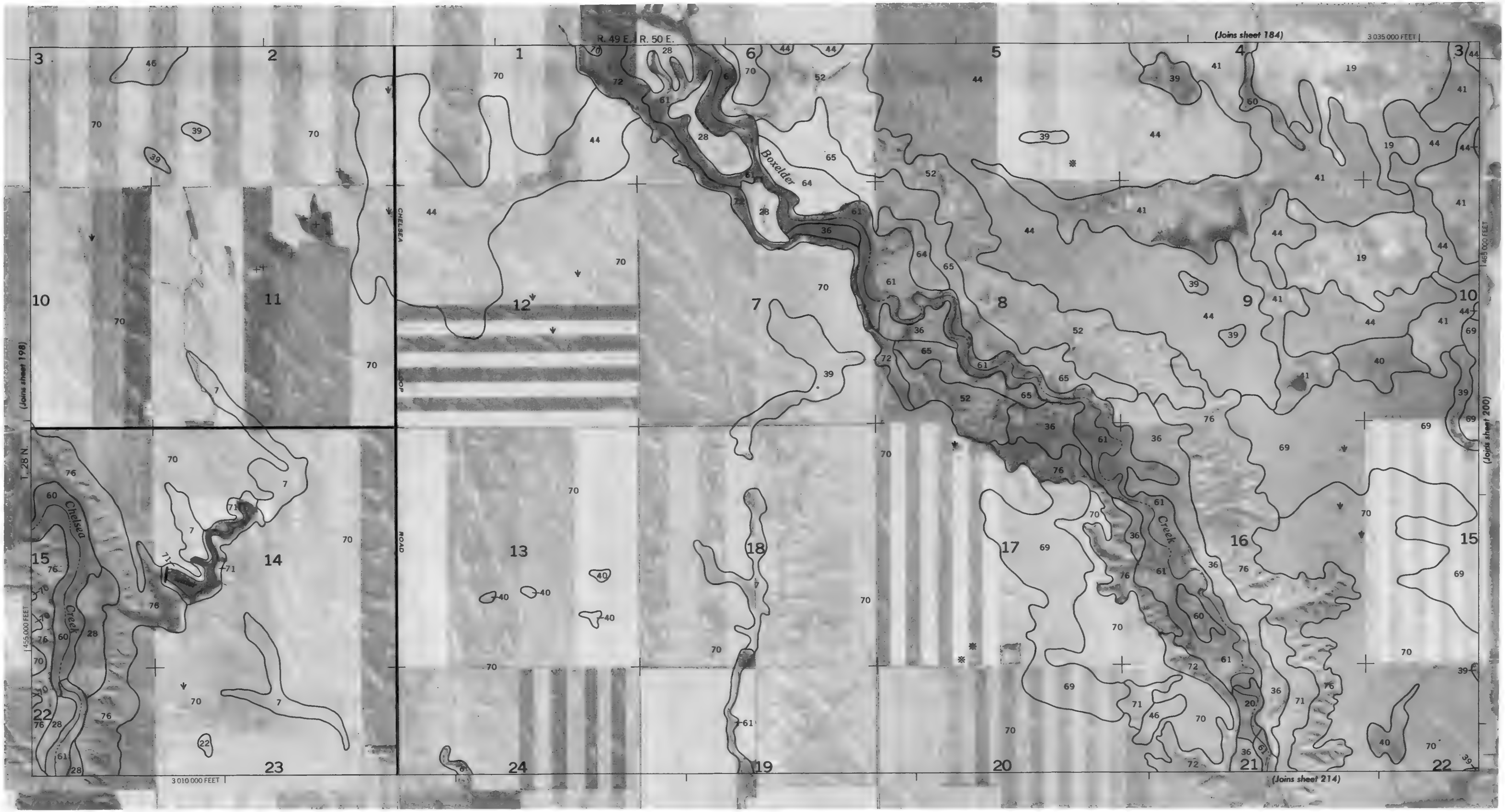
Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 198

N



1 ¾ ½ ¼ 0 1 2 Miles

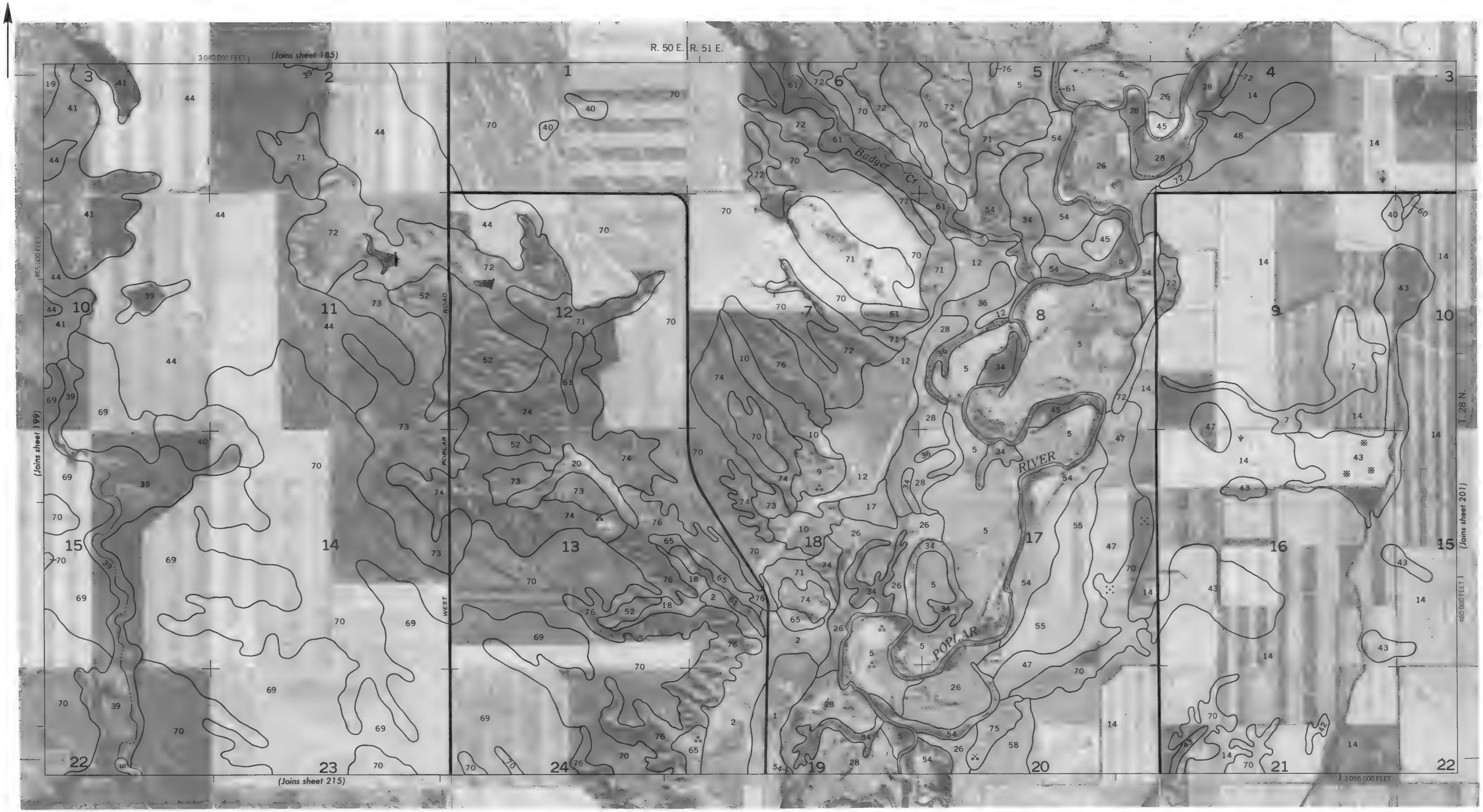
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 199

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 200



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

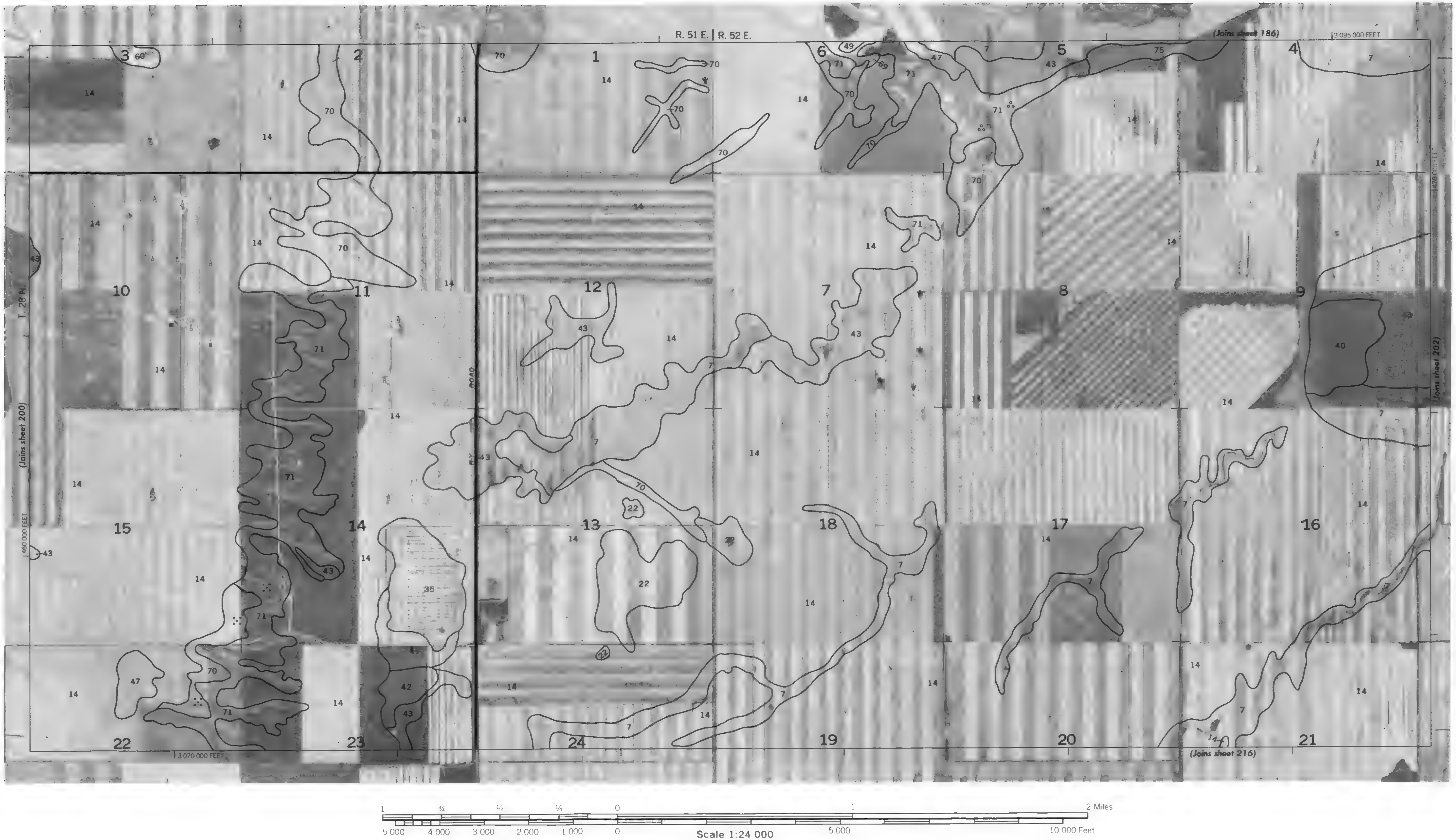
Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 200

201



ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 201

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 202

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

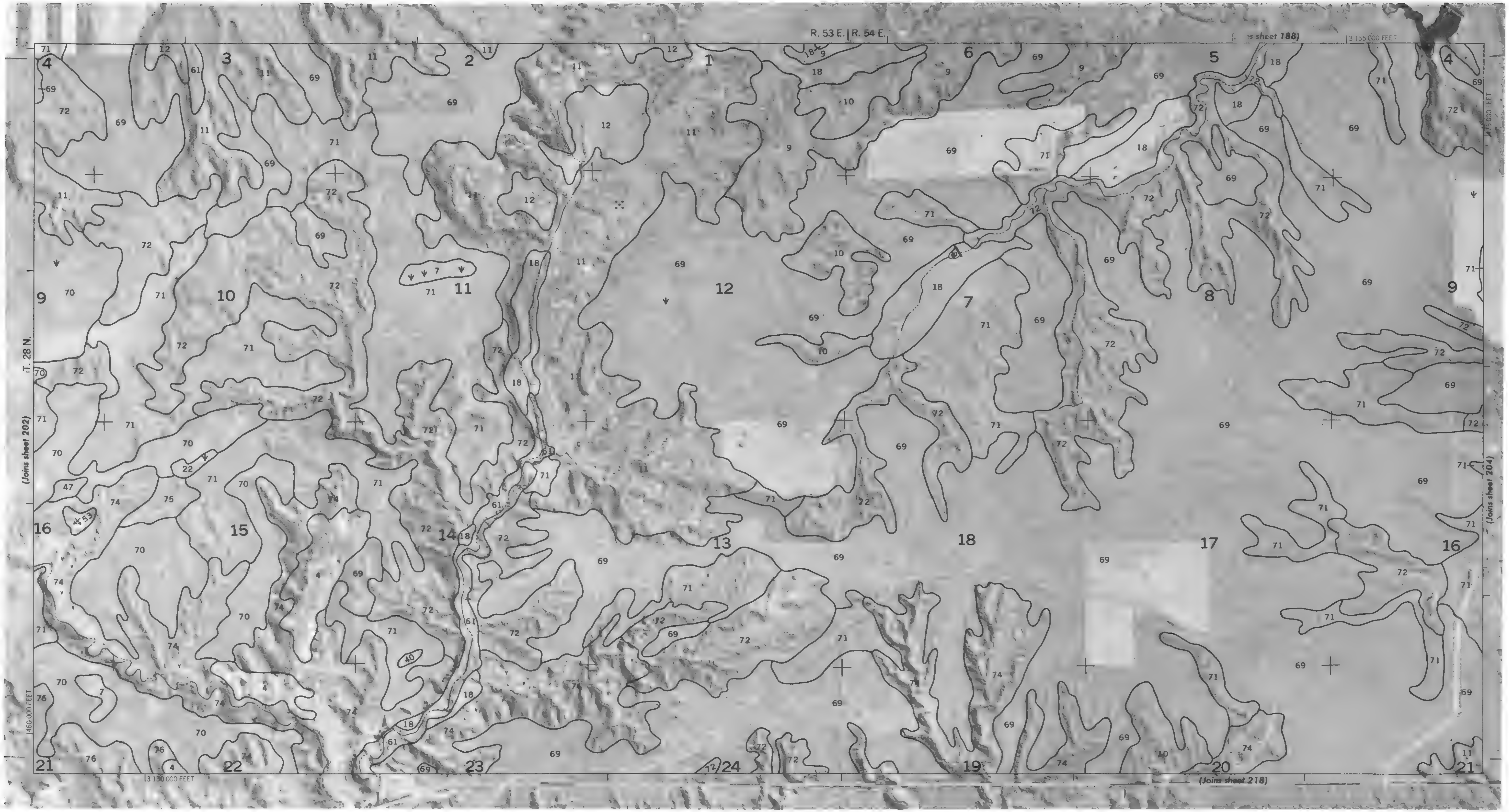
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 202

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 203

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 204

N

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 205

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 206

Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 206

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 207

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

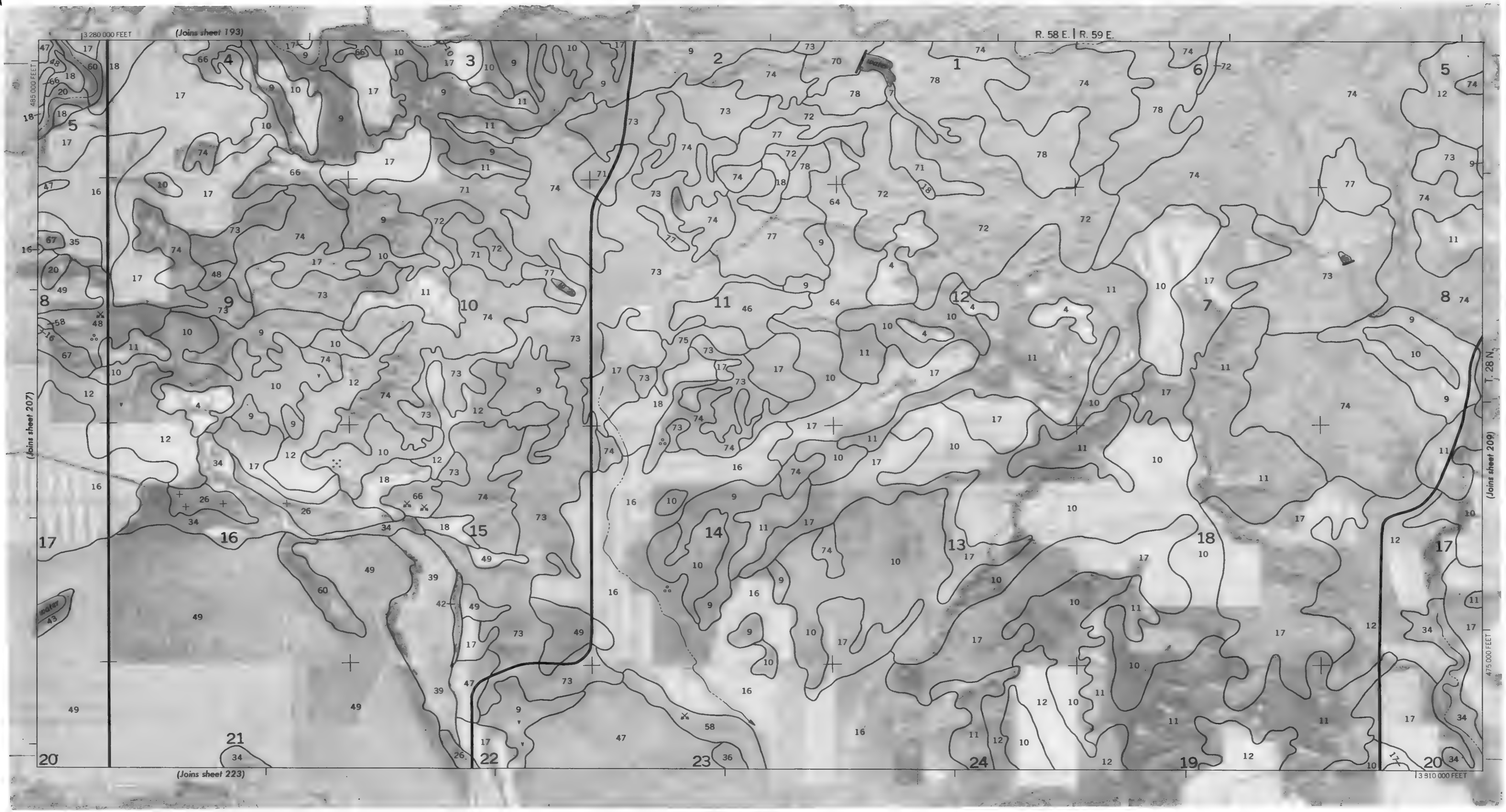
1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 208

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

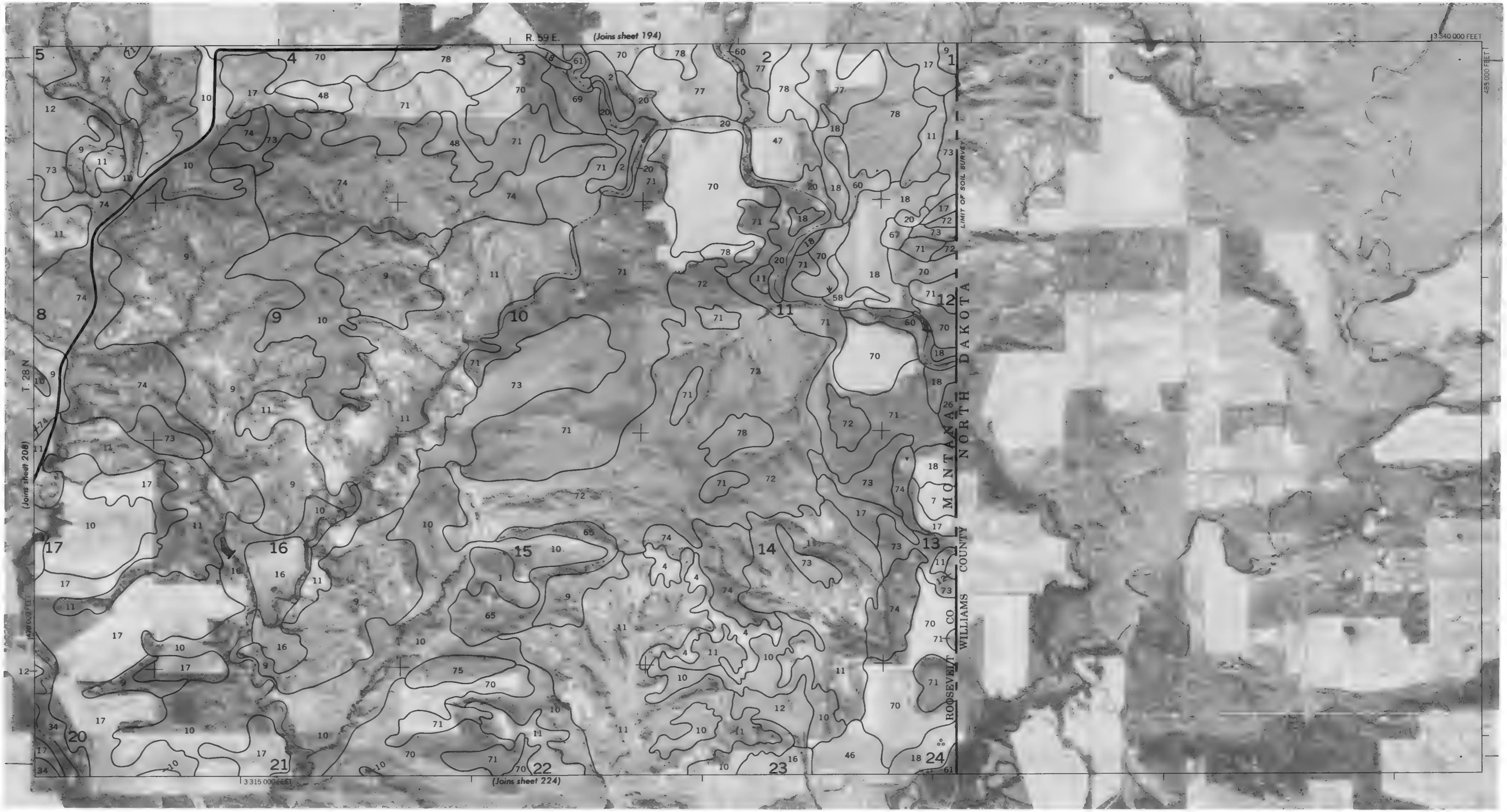
Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 208

N

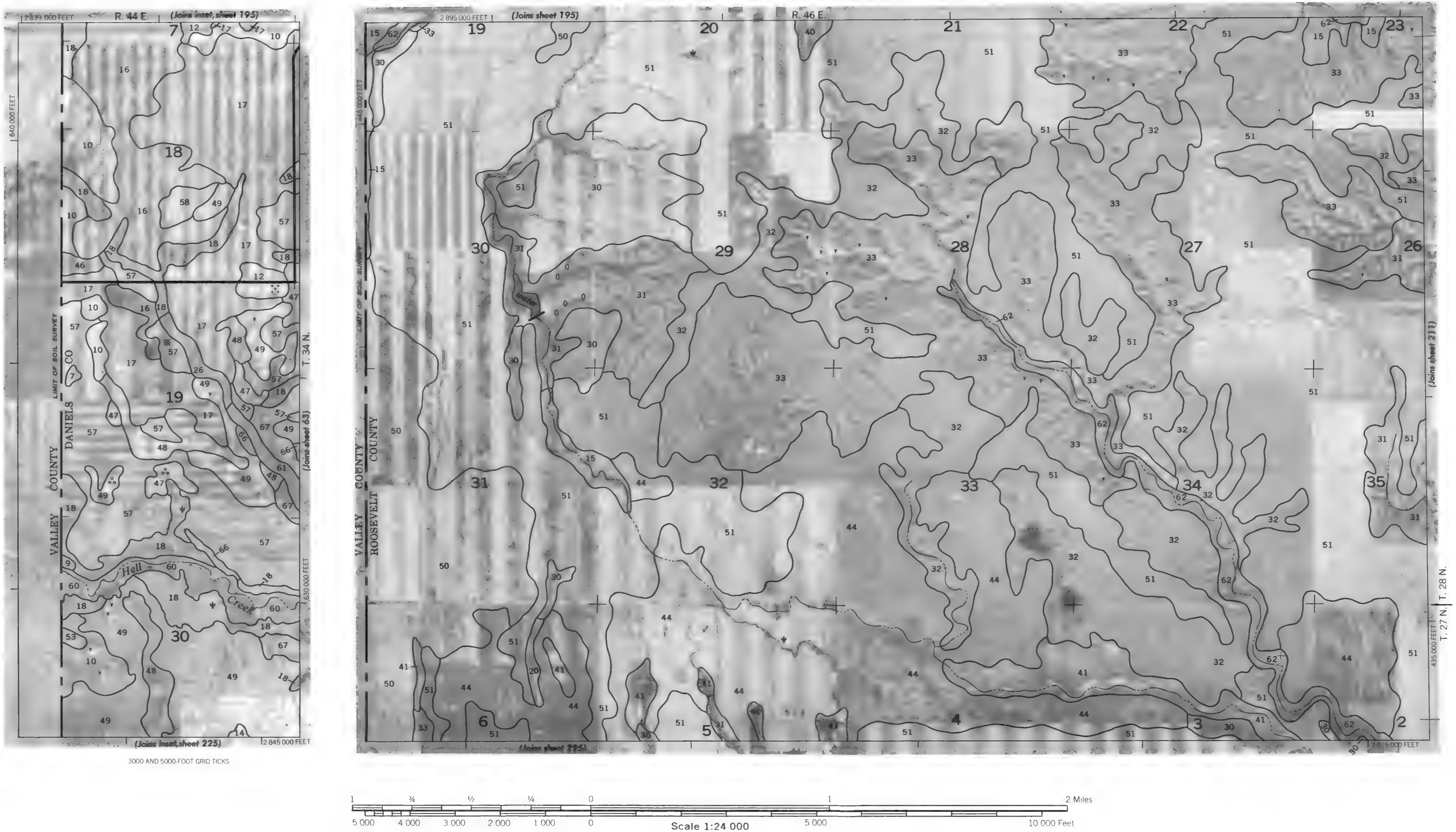


Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 209

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

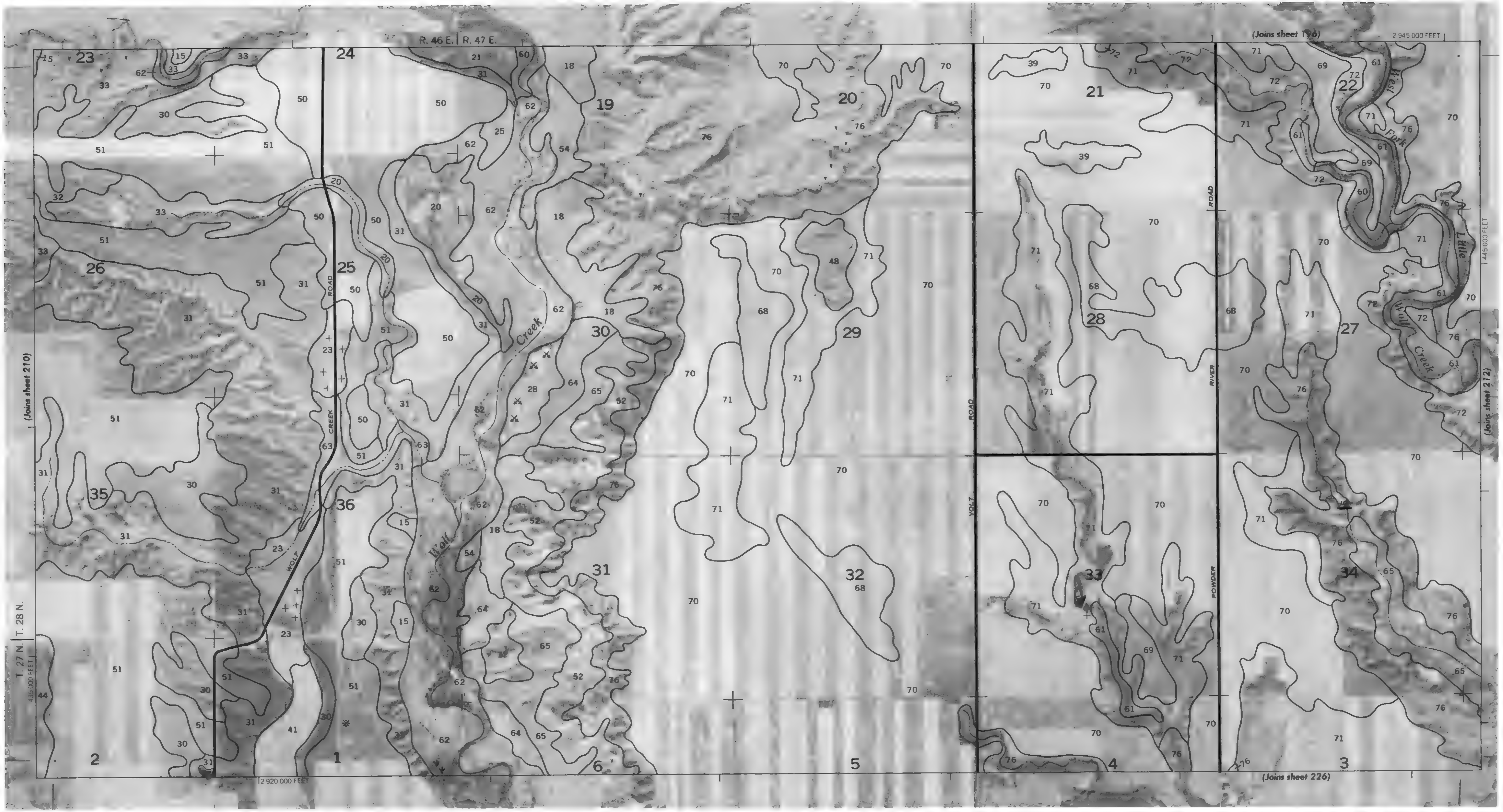
N



Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 210



Scale 1:24 000

1 ¾ ½ ¼ 0 1 2 Miles

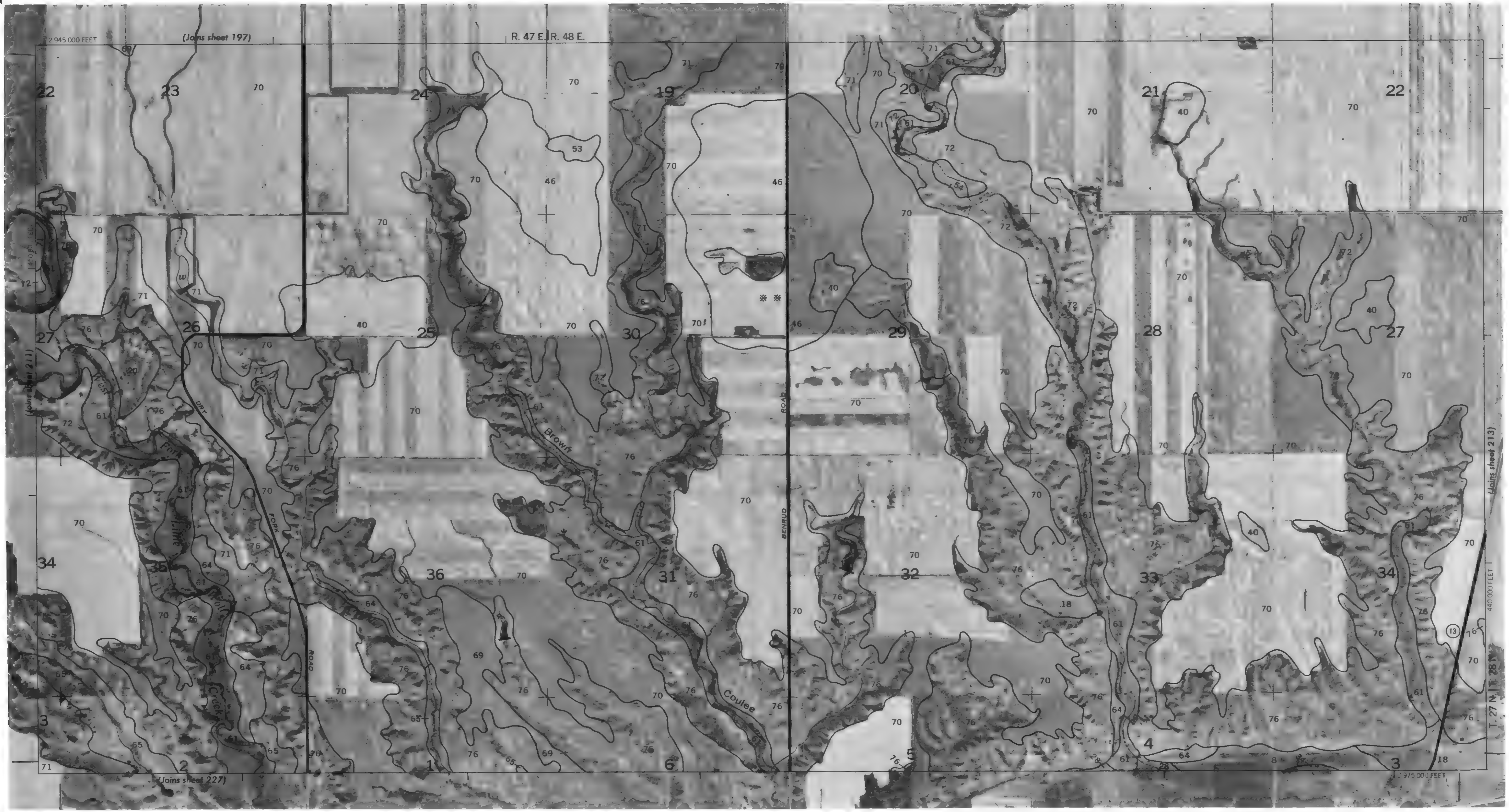
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 211

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 212

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 212

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 213

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 214

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

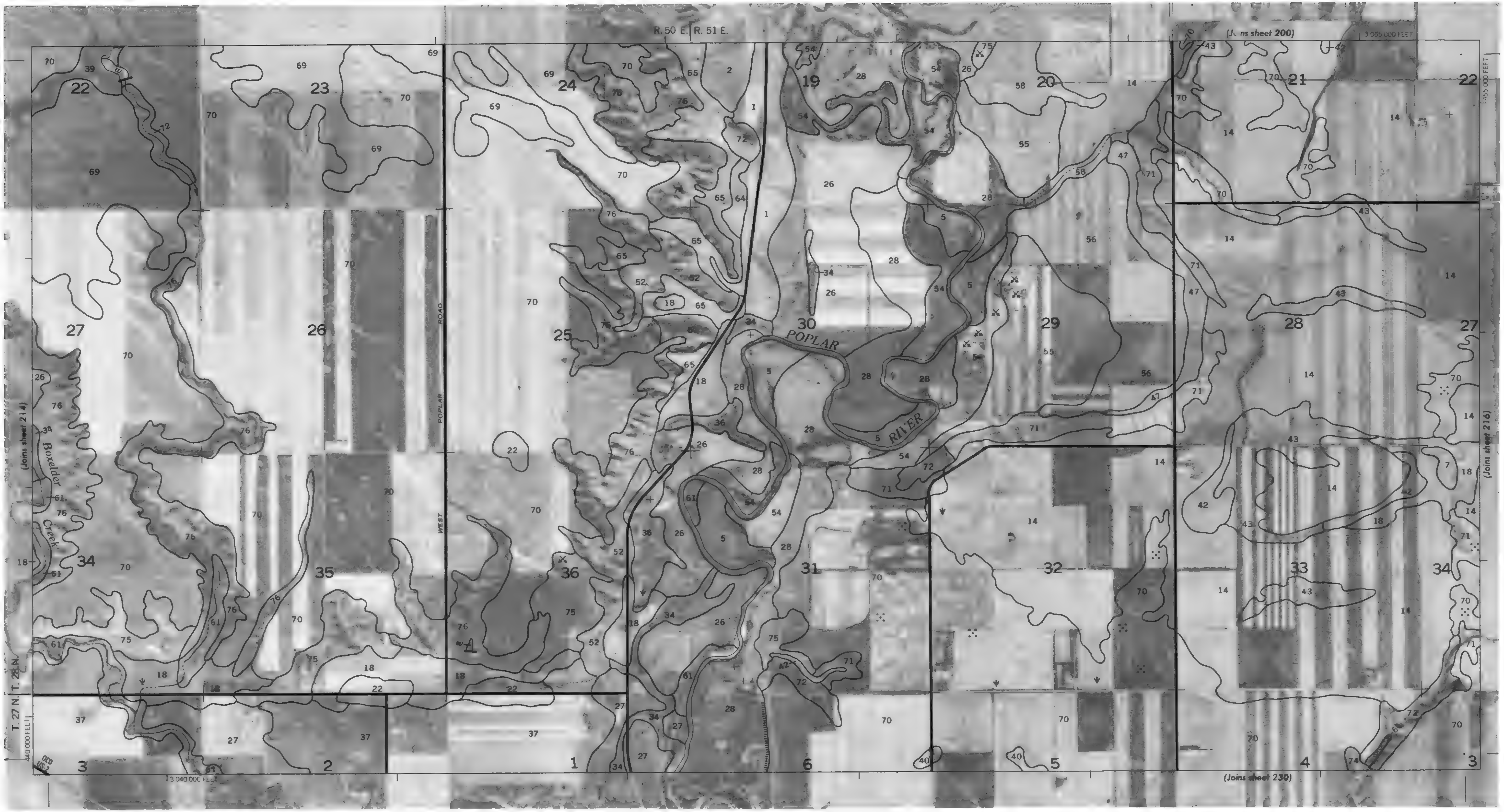
Scale 1:24 000

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

Coordinate grid ticks and land division corners, if shown, are approximately positioned

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 215

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



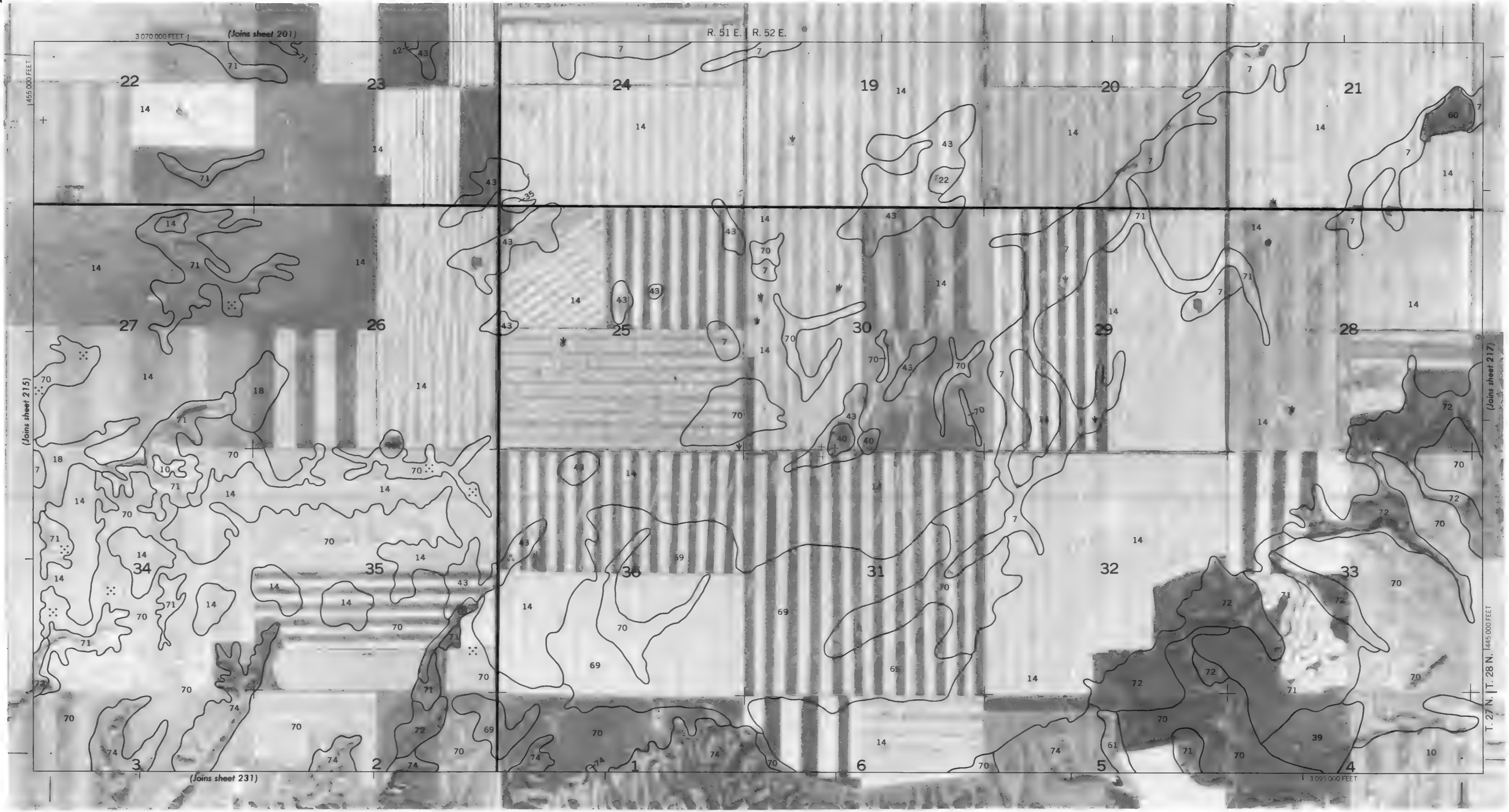
1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 216

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

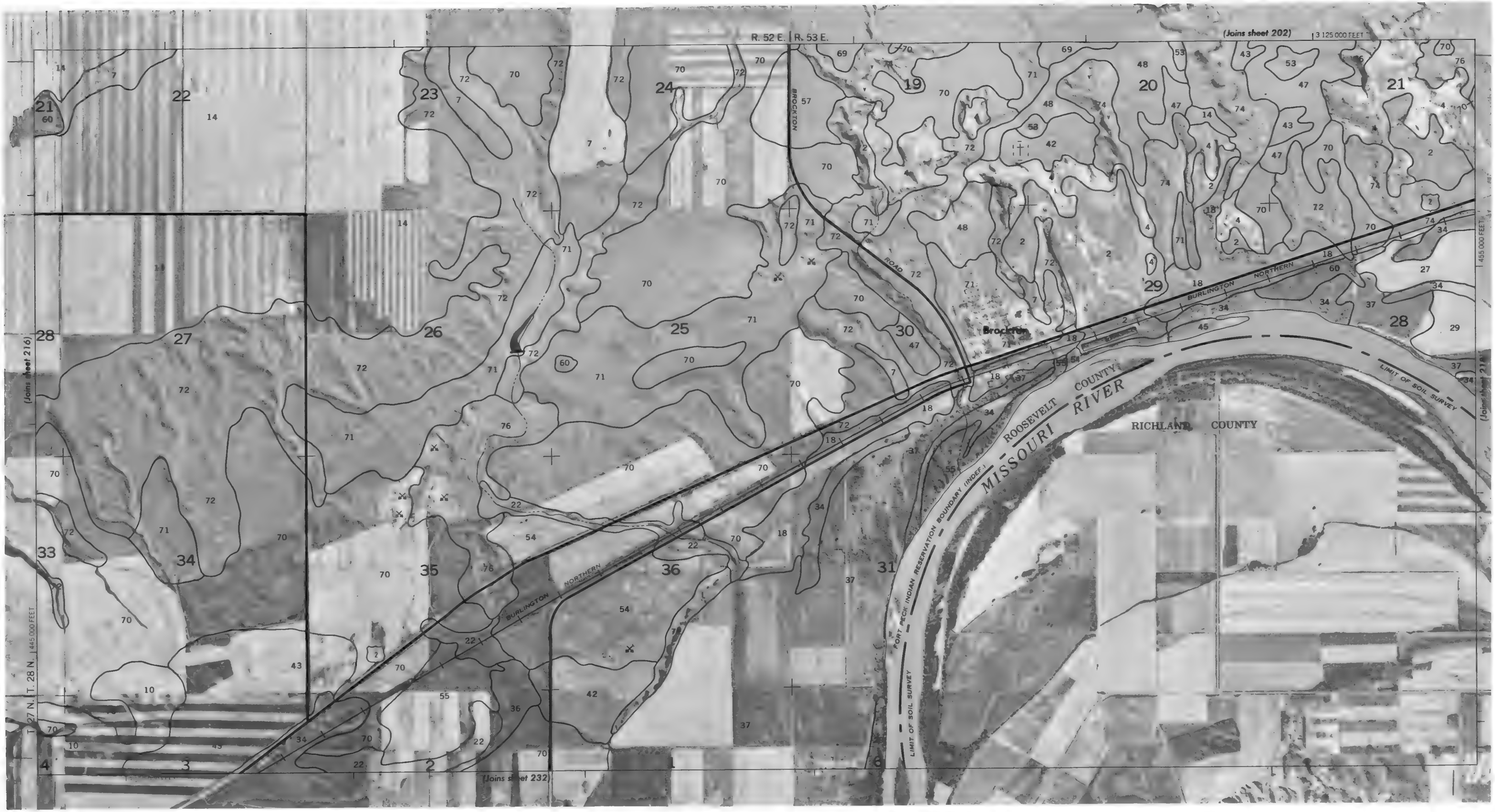
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 216

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 217

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

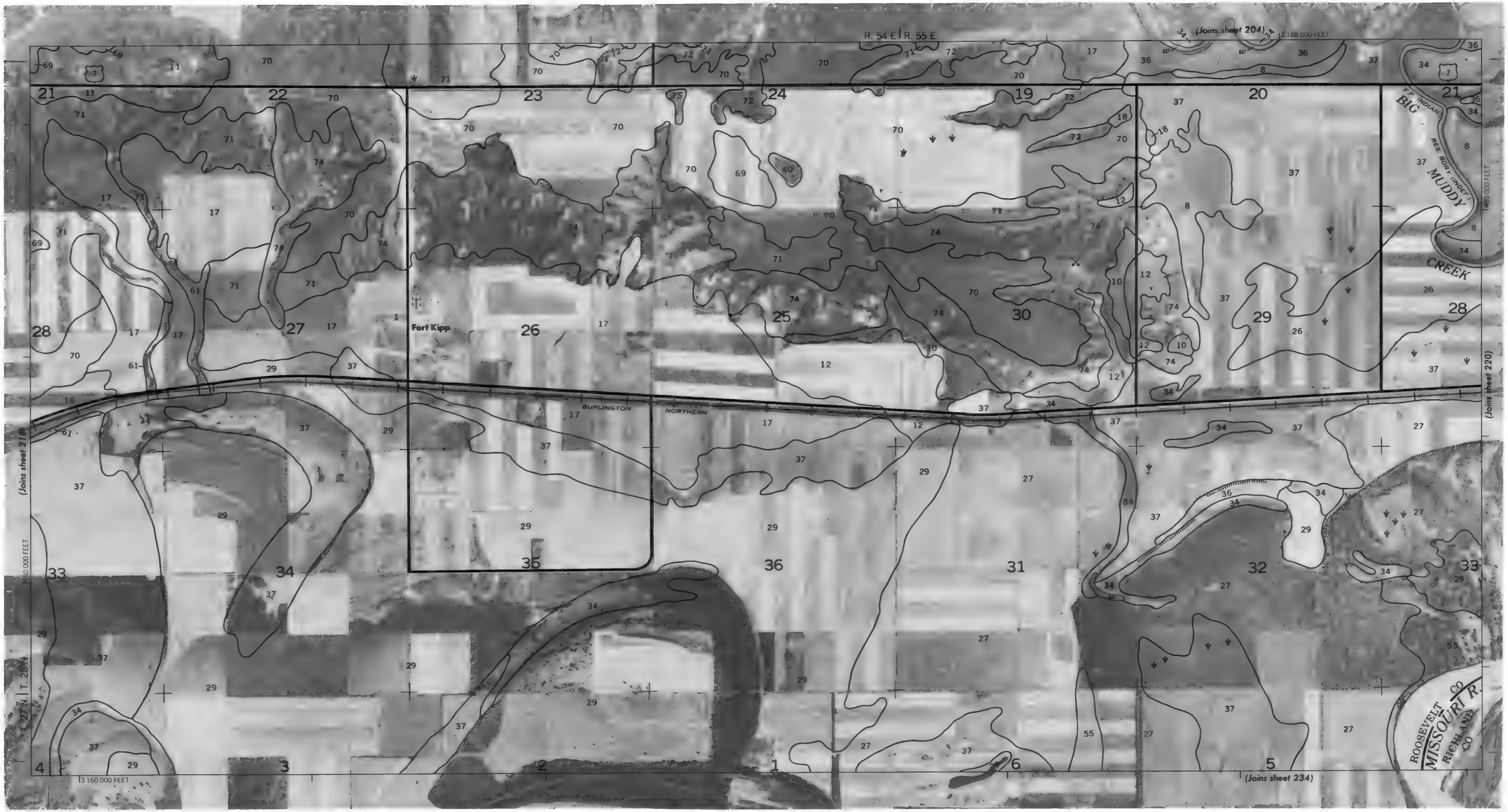
Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 220

N

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.

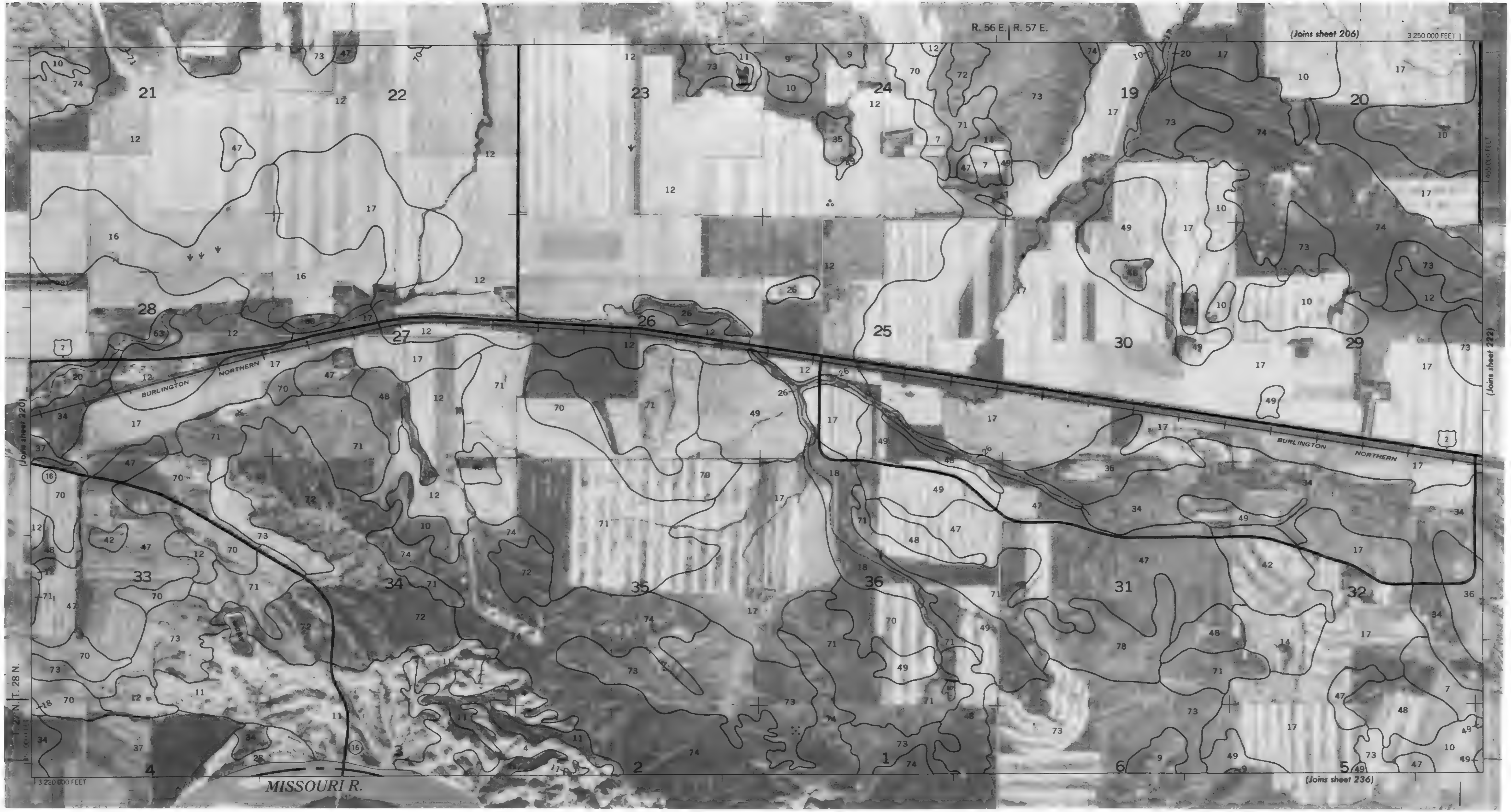
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 220

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 221

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N

1 ¾ ½ ¼ 0 1 2 Miles

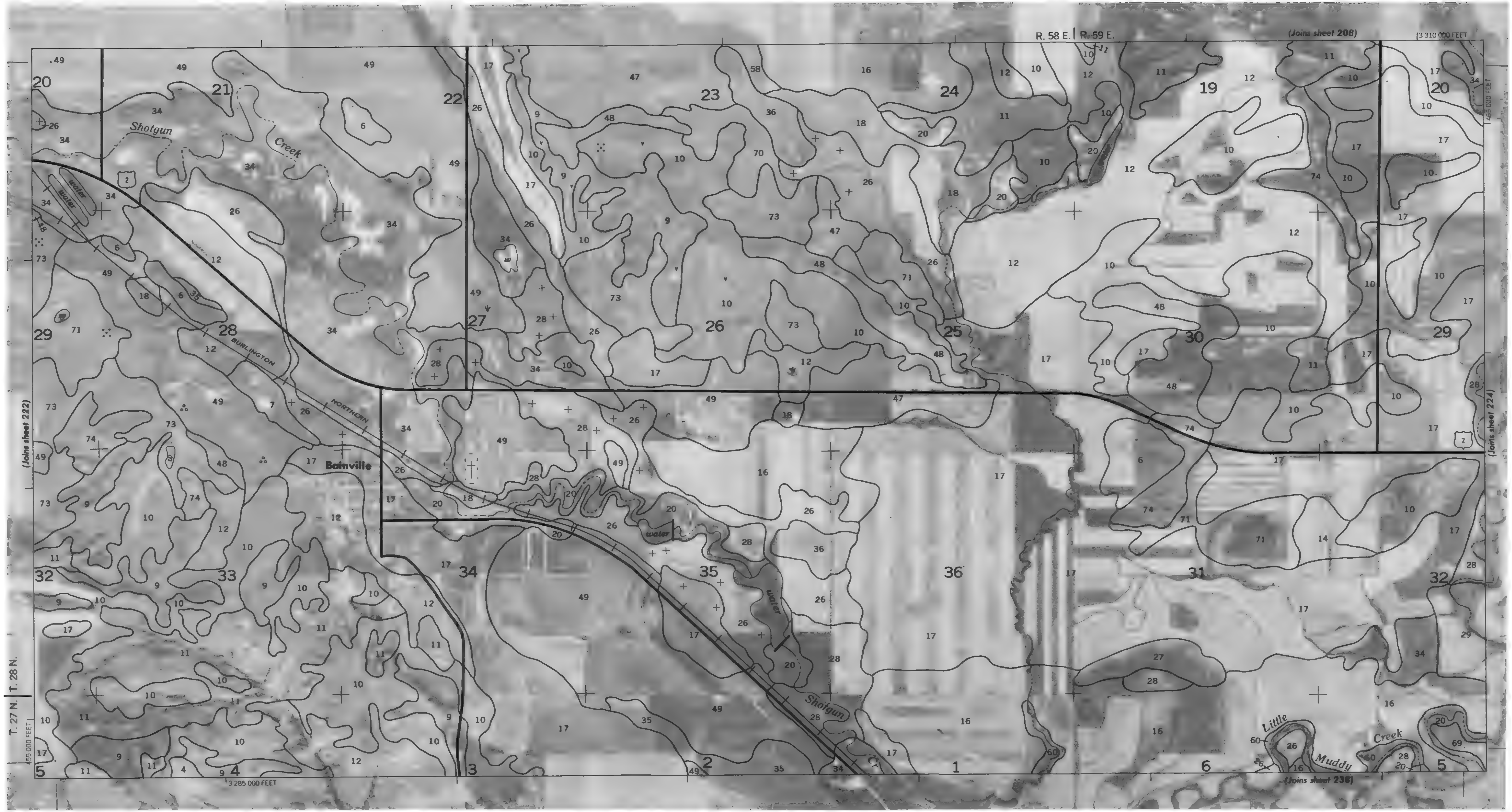
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 222

N



1 ¾ ½ ¼ 0 1 2 Miles

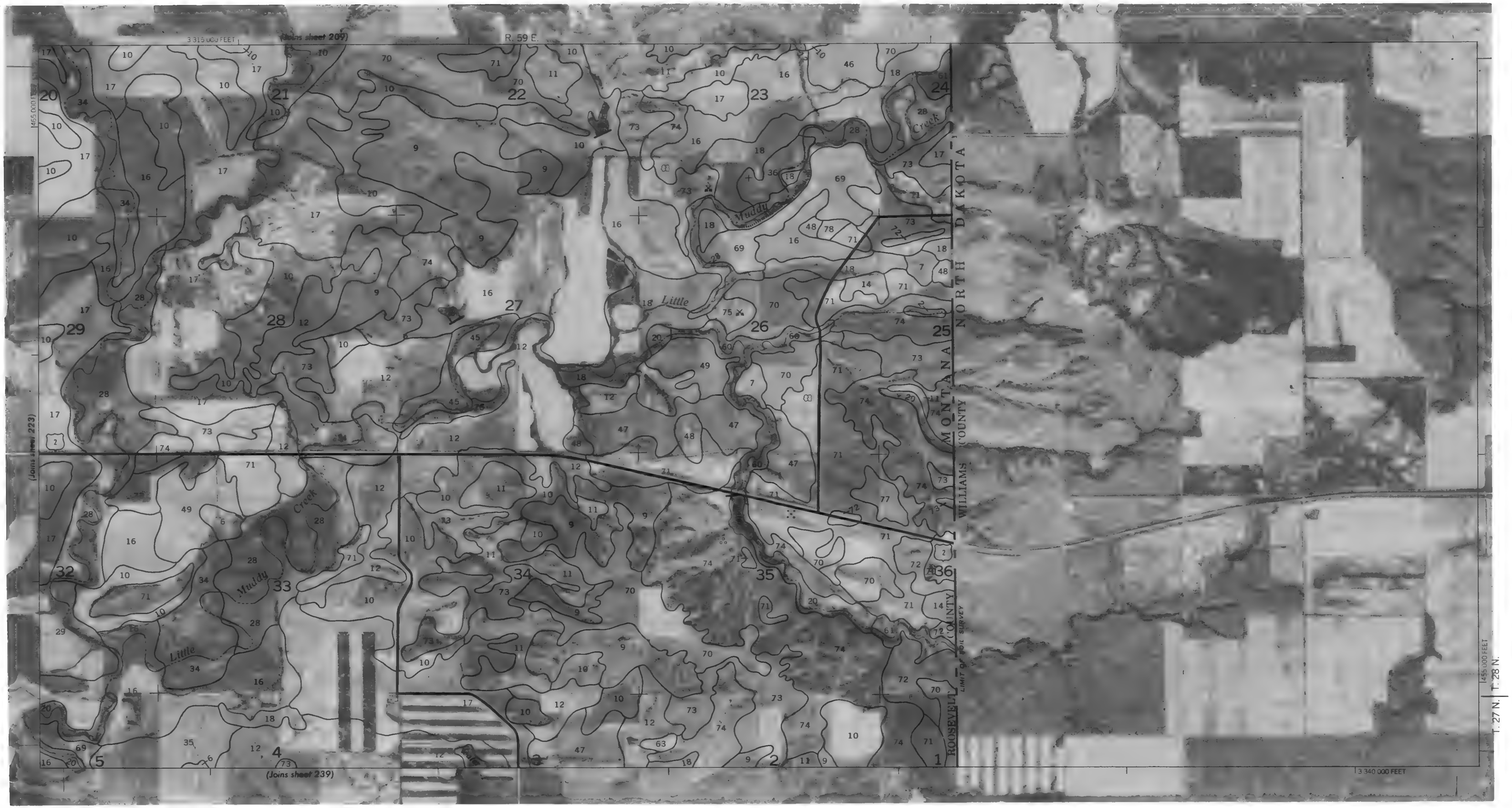
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 223

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

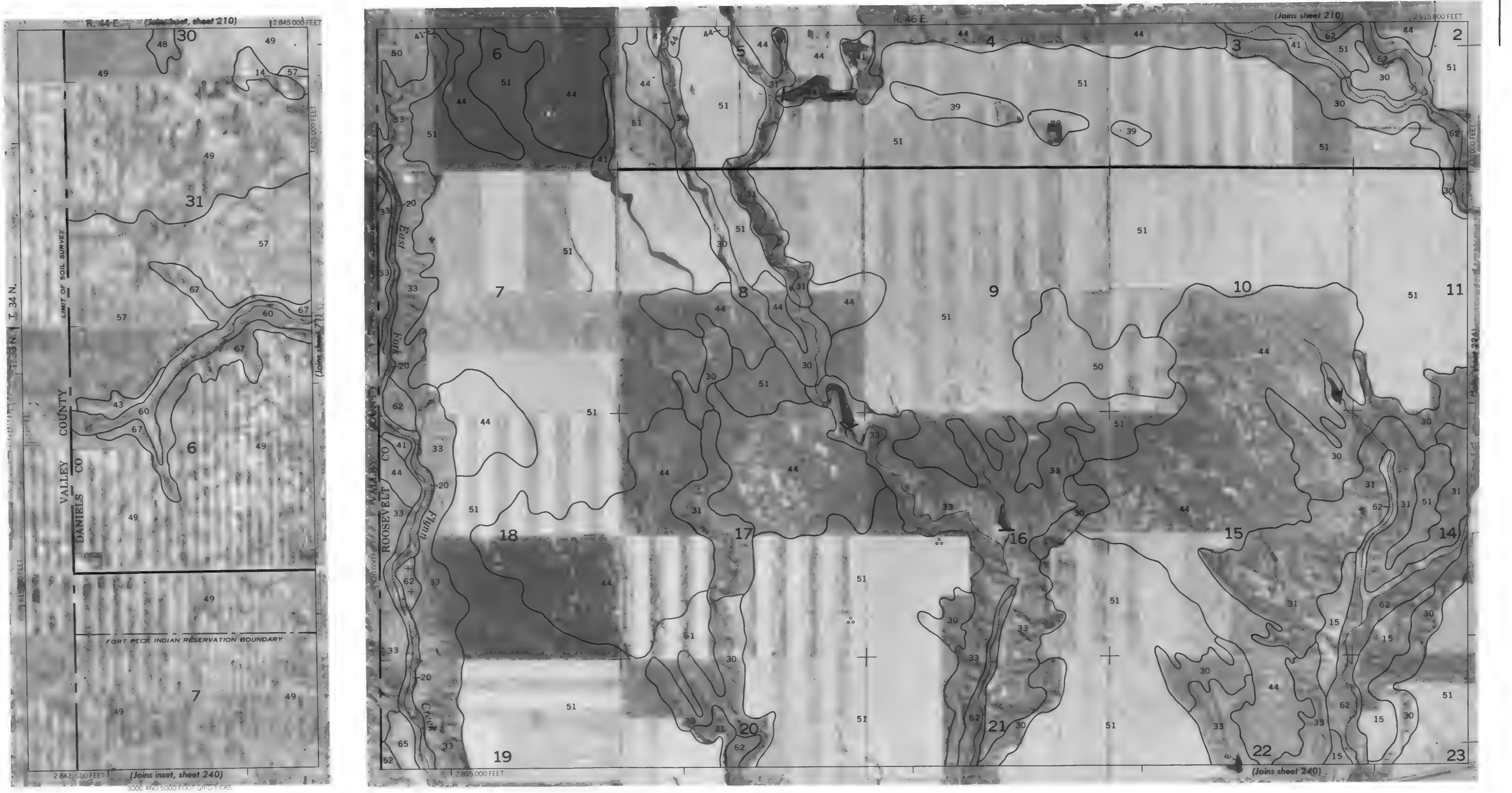
Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 225

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

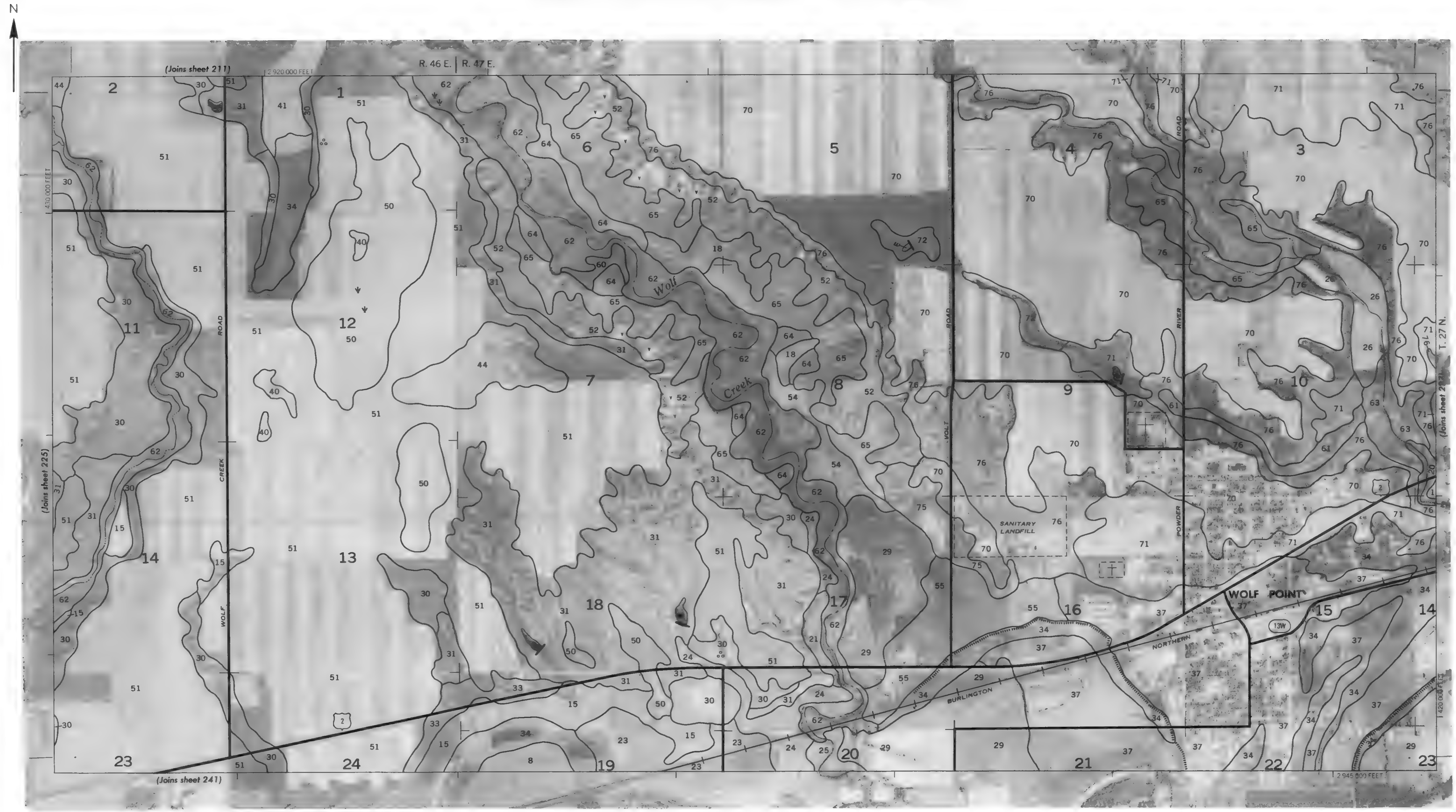


Scale 1:24 000

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 226



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned

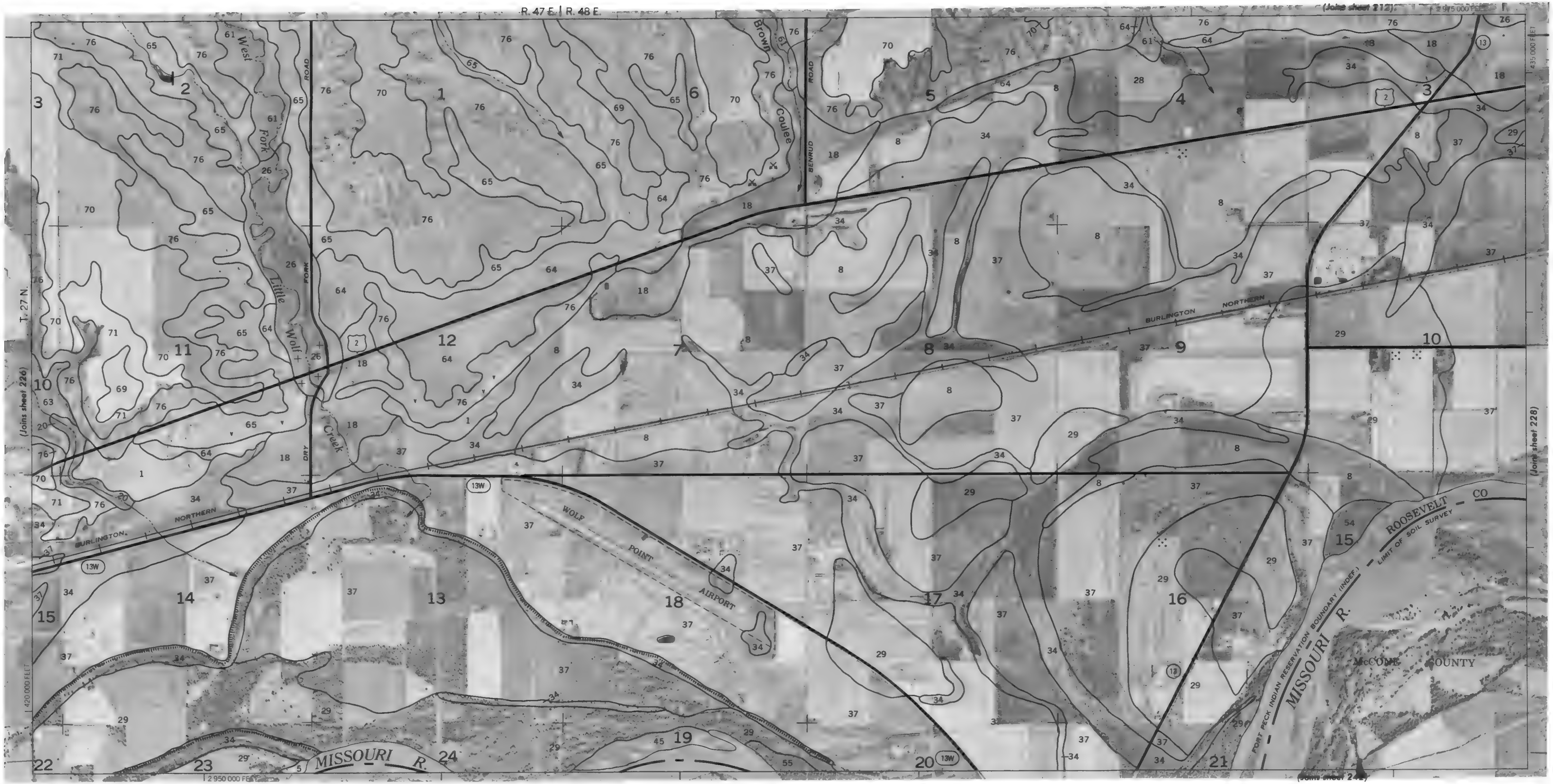
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 226

227

N

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

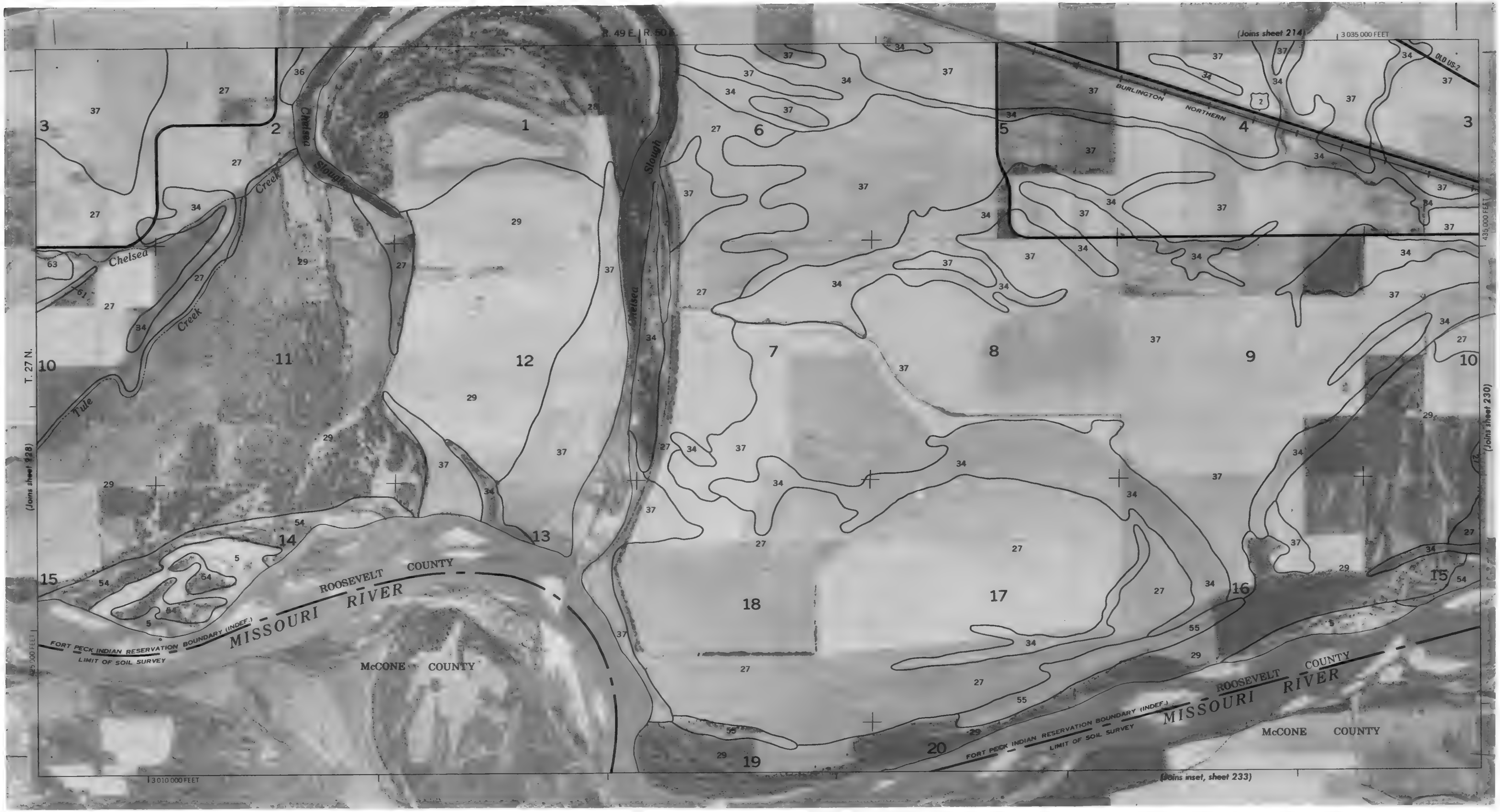
Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 228

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 229

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

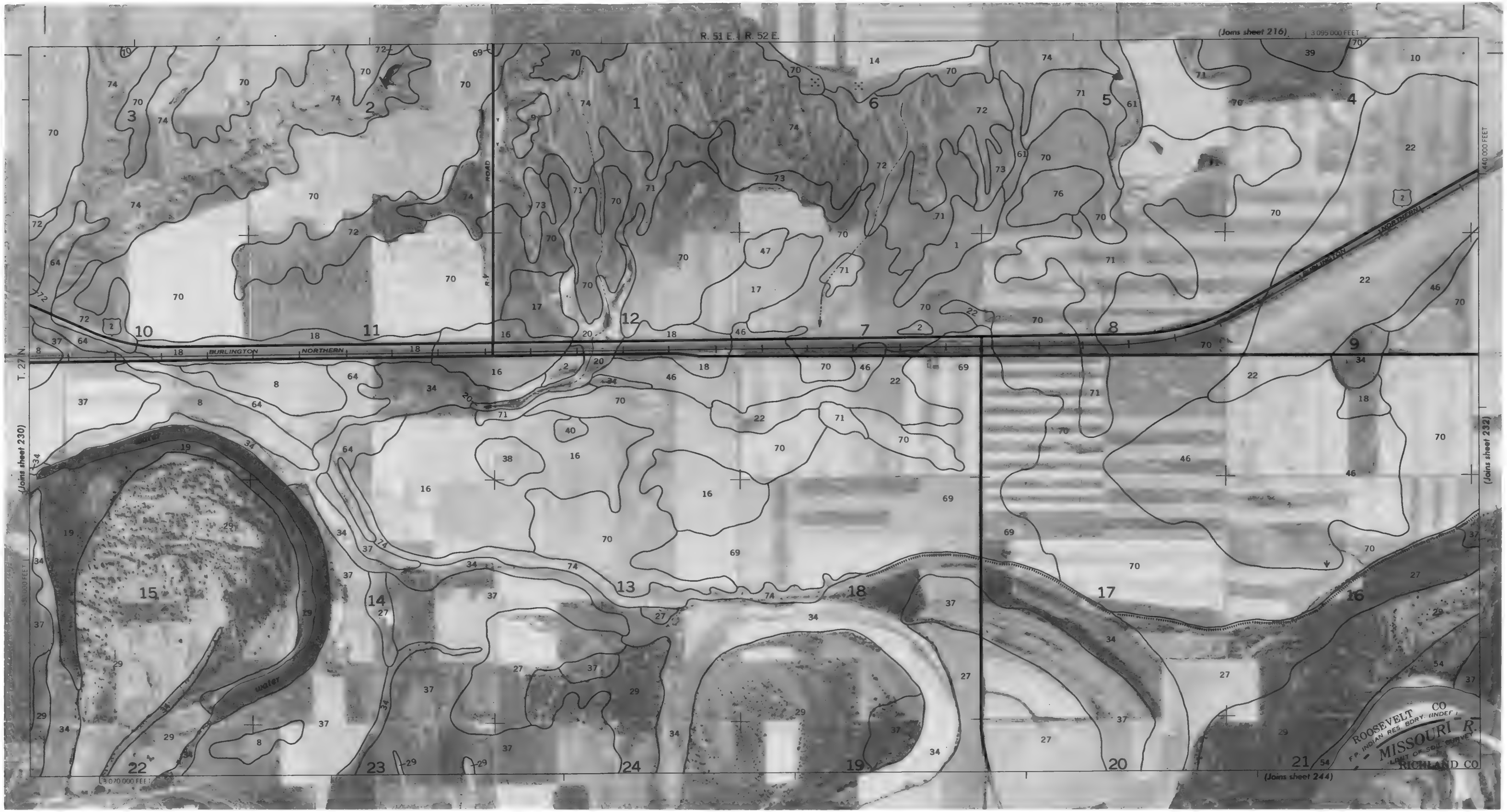
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

231

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 231

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 232

N

1 ¾ ½ ¼ 0 1 2 Miles

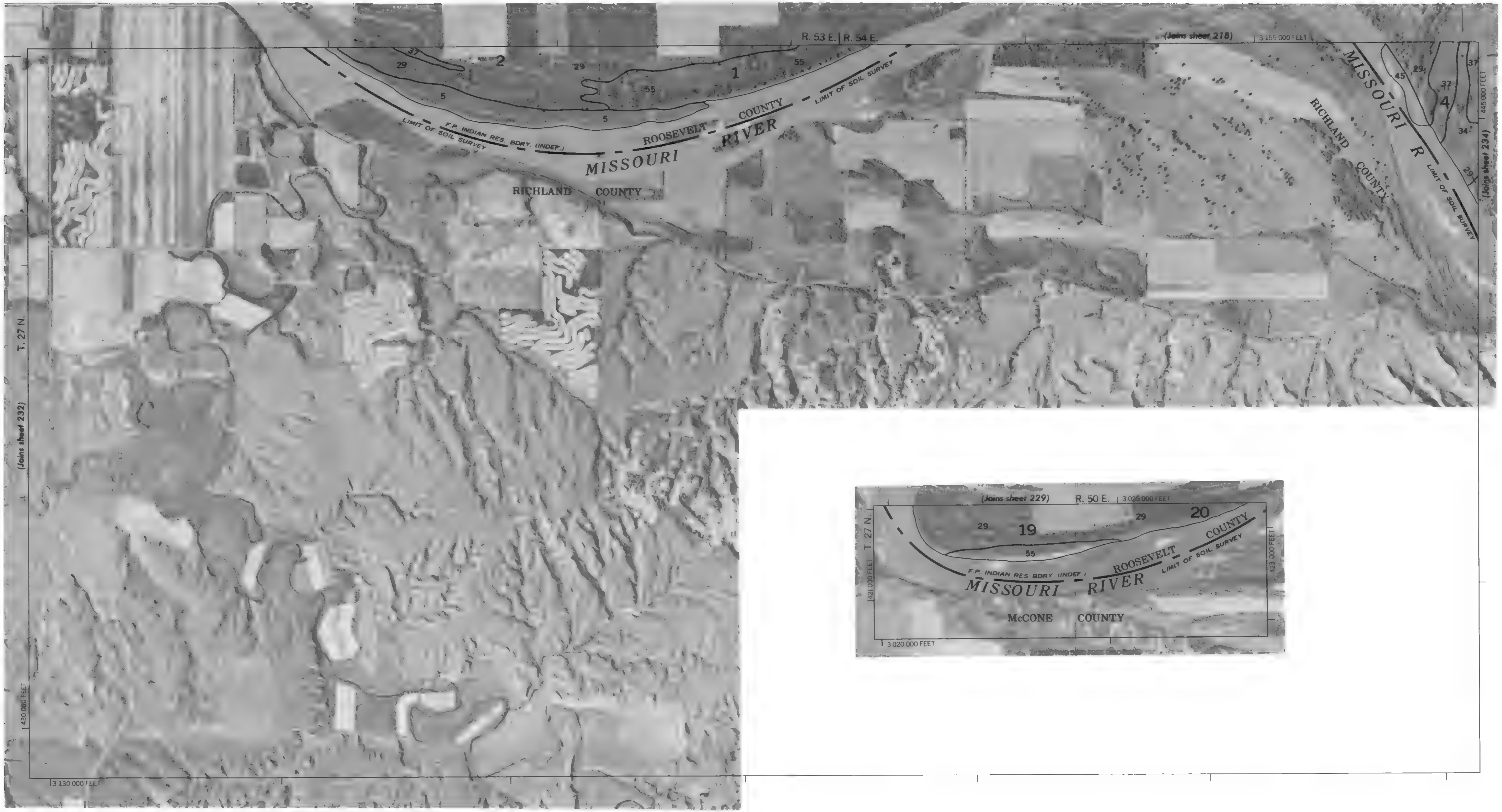
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

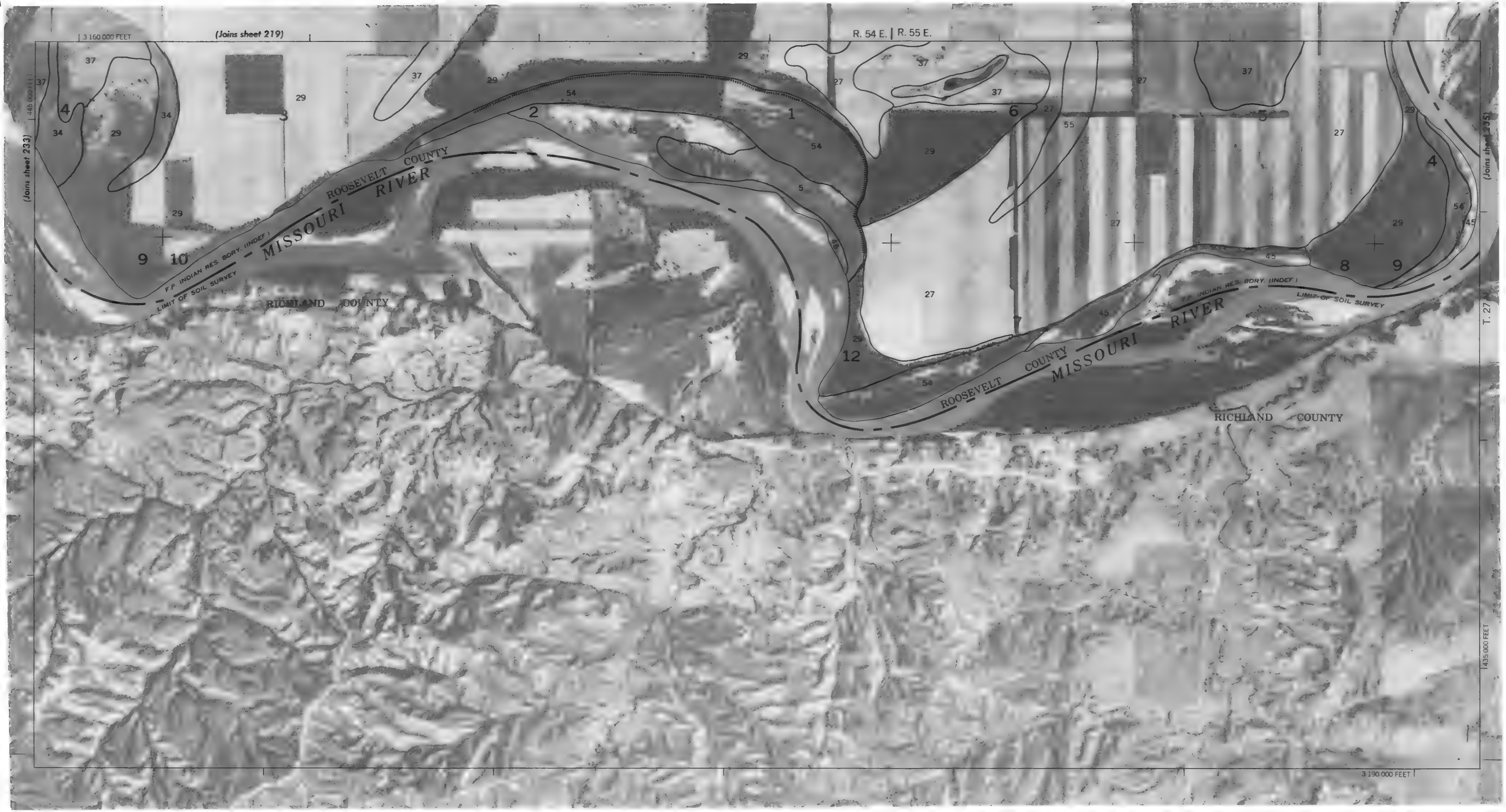
Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 233

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 234



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned

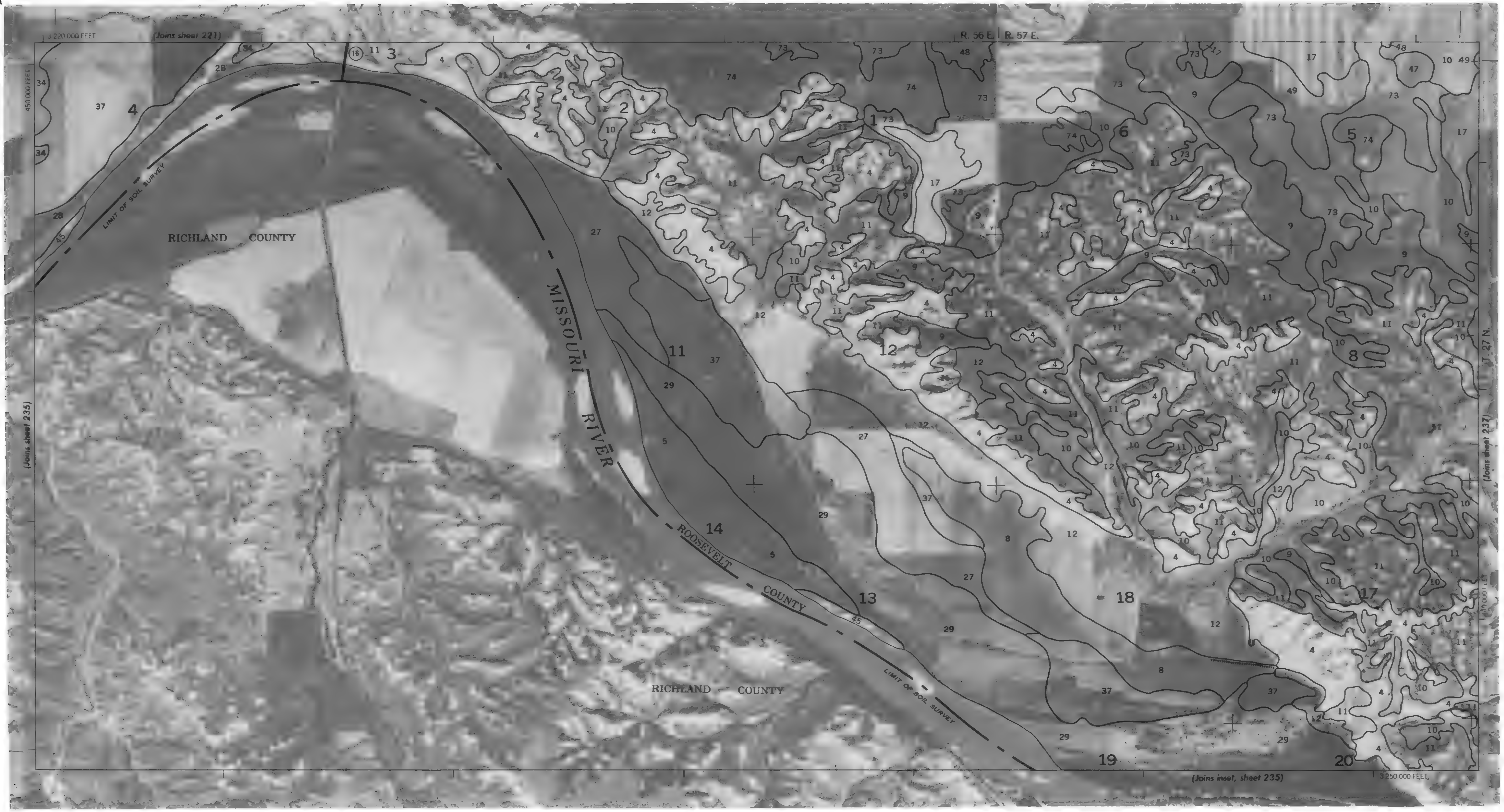
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 235

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1974 and 1975 [illegible] photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating [illegible]

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 237

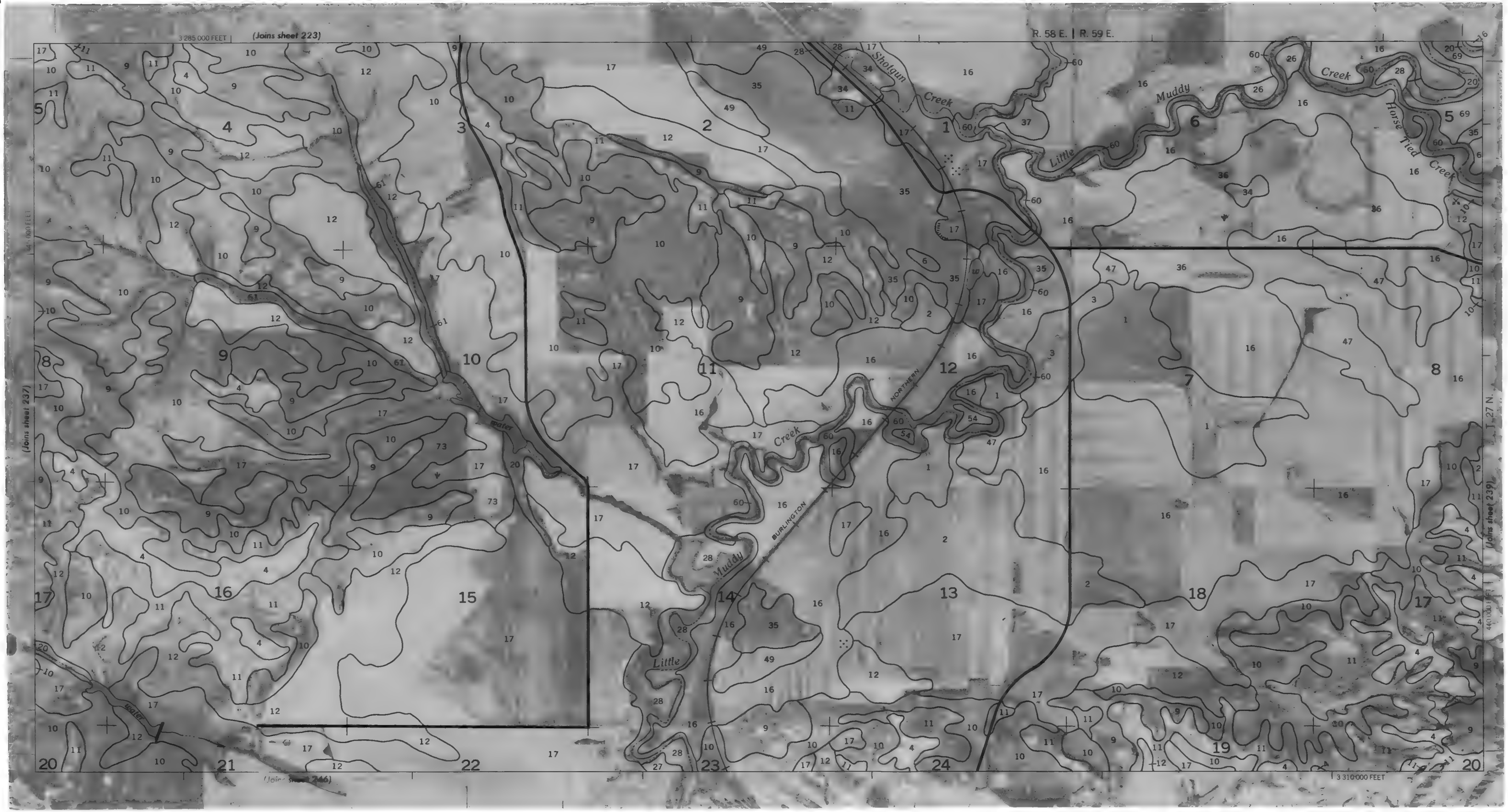
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.

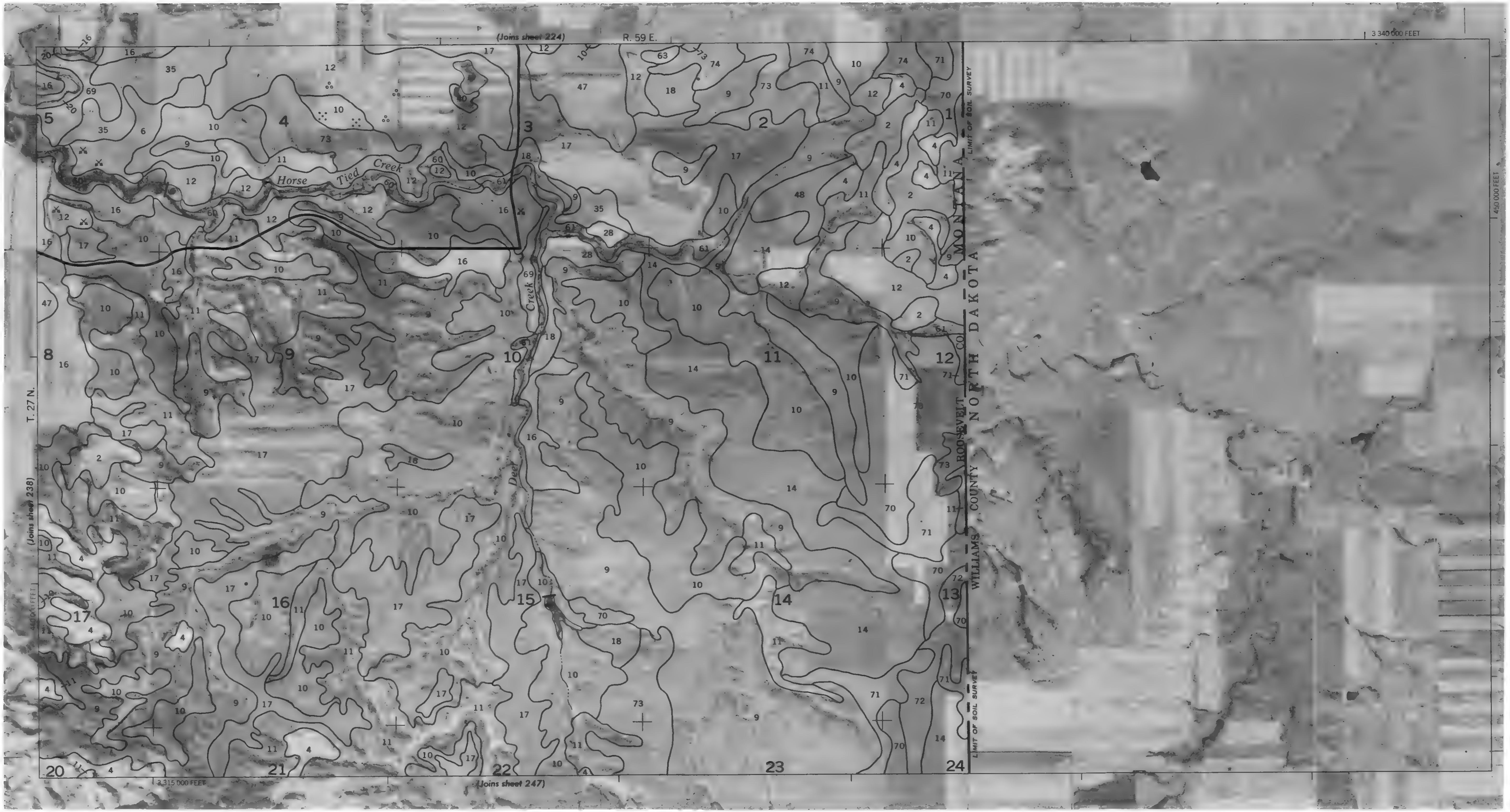
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 238

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 239

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



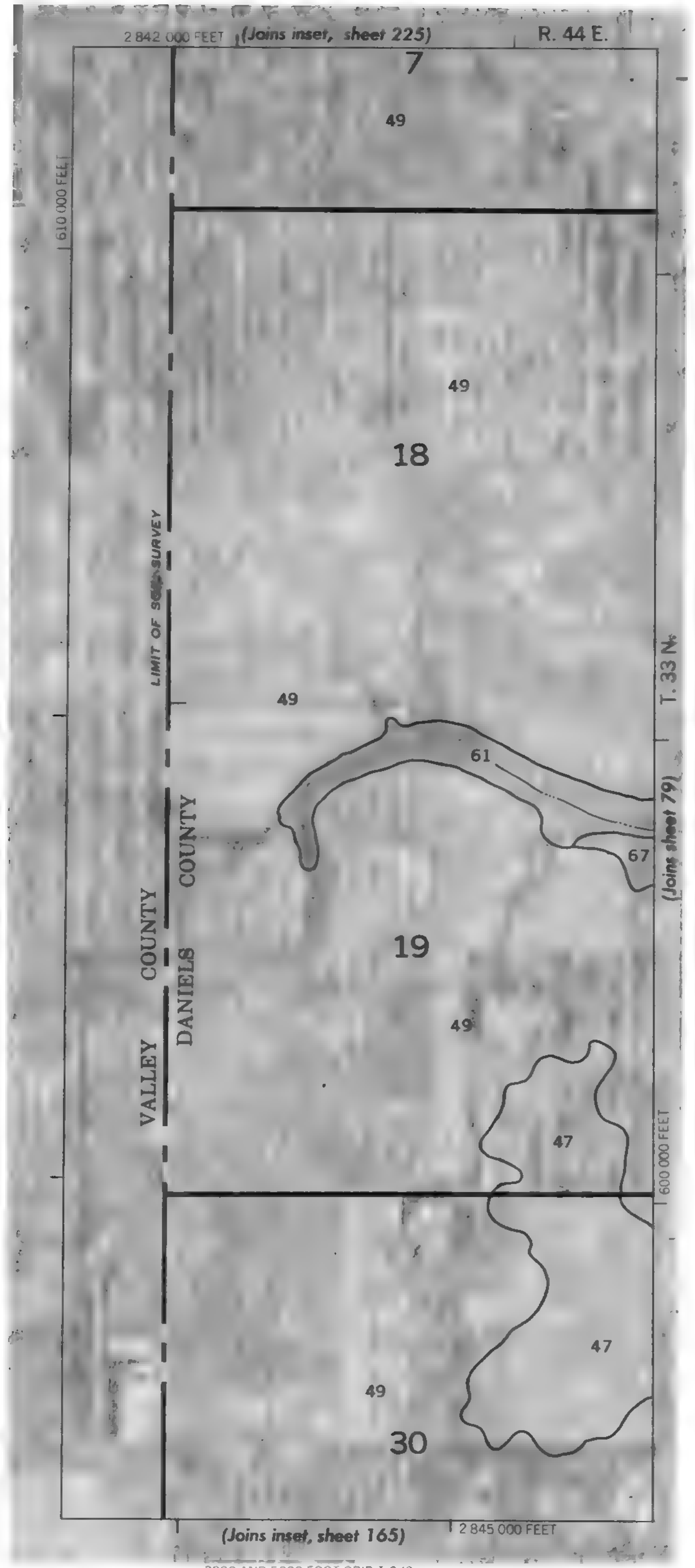
1 ¾ ½ ¼ 0 1 2 Miles

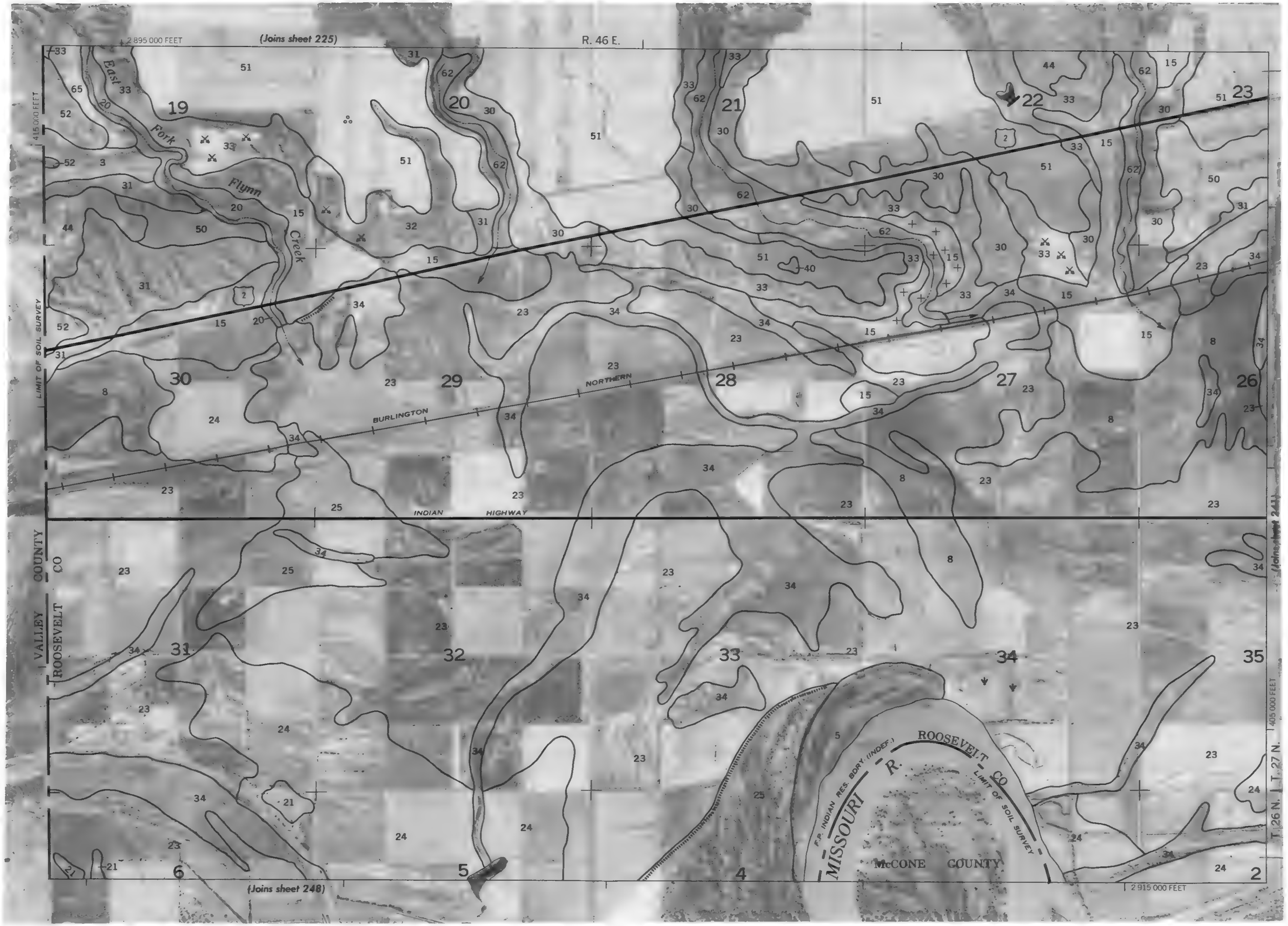
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 240





1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 240

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 241

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N

1 ¾ ½ ¼ 0 1 2 Miles

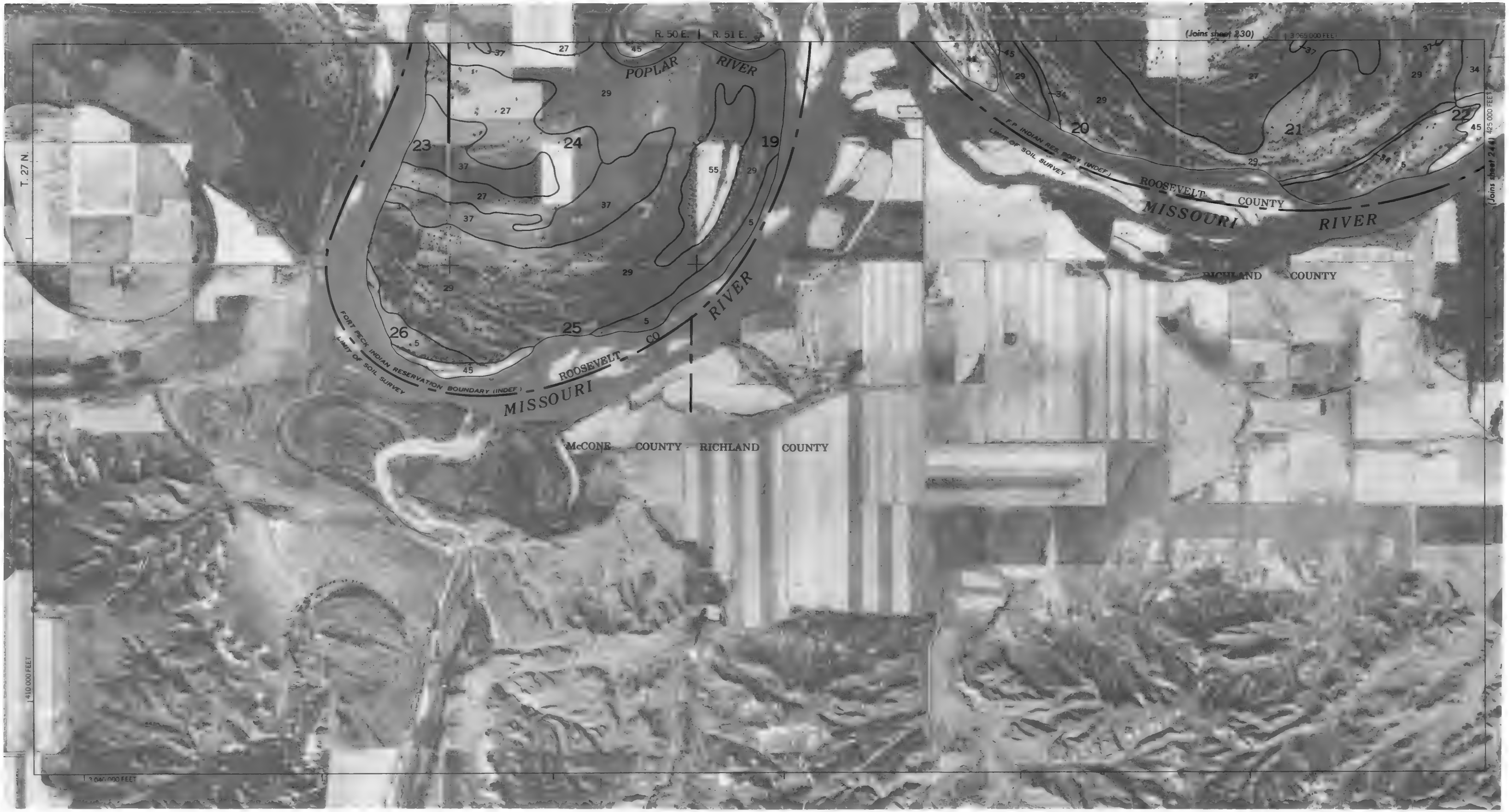
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 243

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N

1 ¾ ½ ¼ 0 1 2 Miles

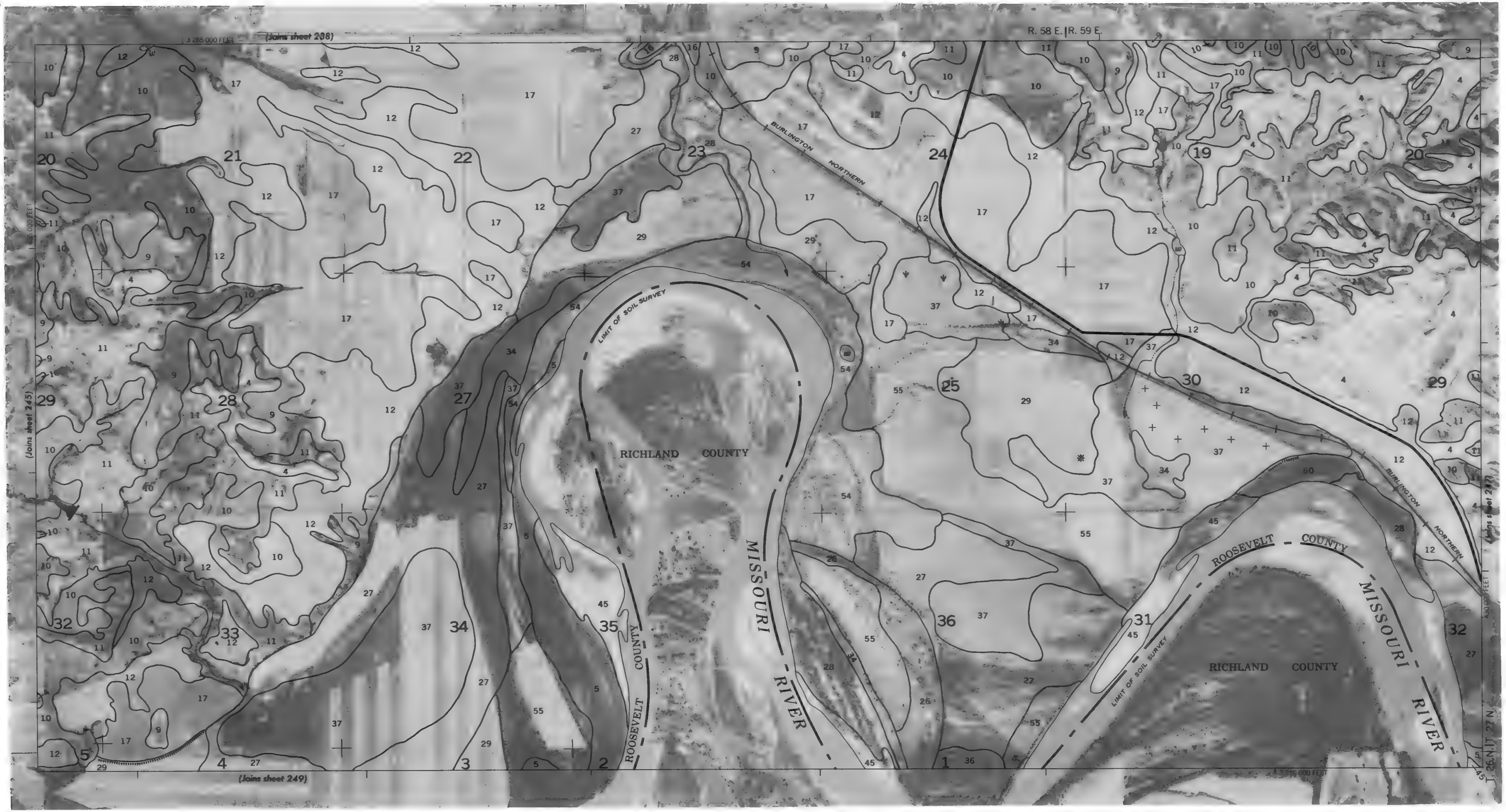
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 245

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

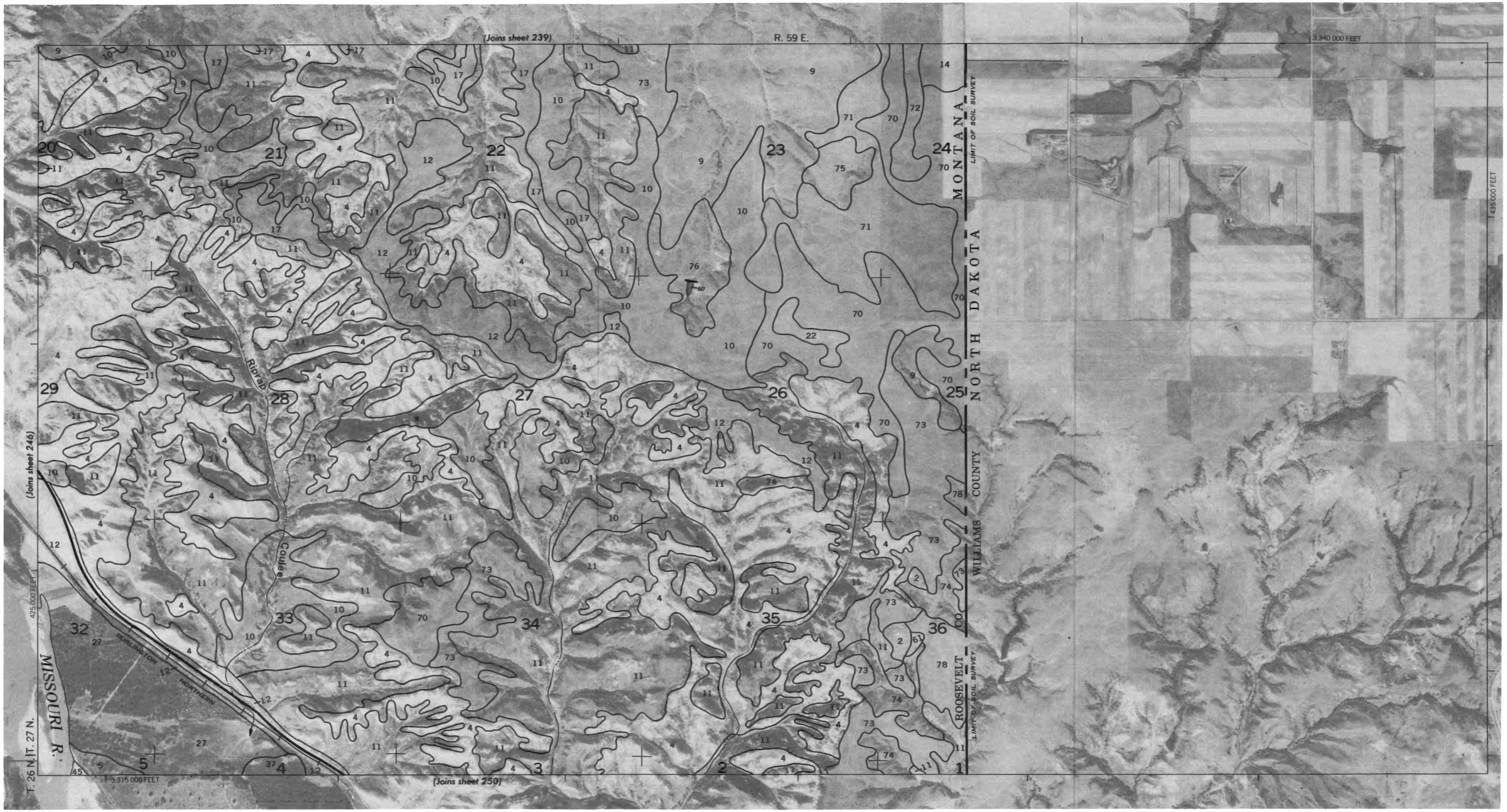
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

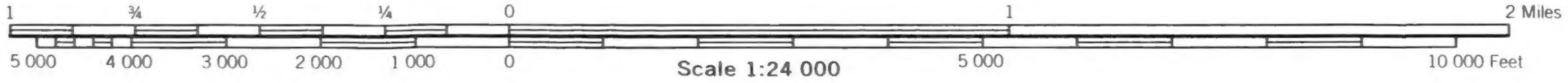
247

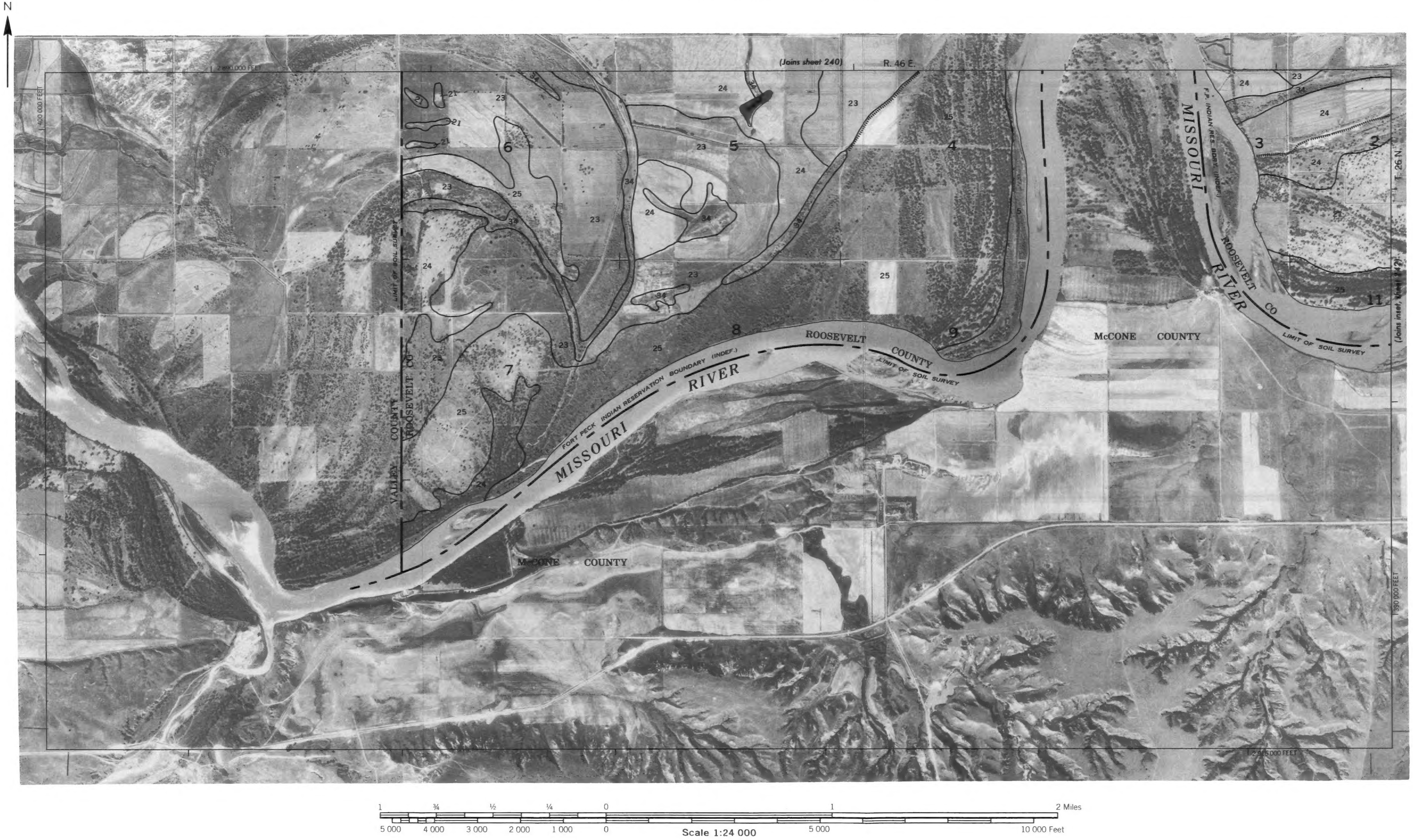
N

ROOSEVELT AND DANIELS COUNTIES, MONTANA NO. 247

This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.







Coordinate grid ticks and land division corners, if shown, are approximately positioned.
This map is compiled on 1974 and 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N

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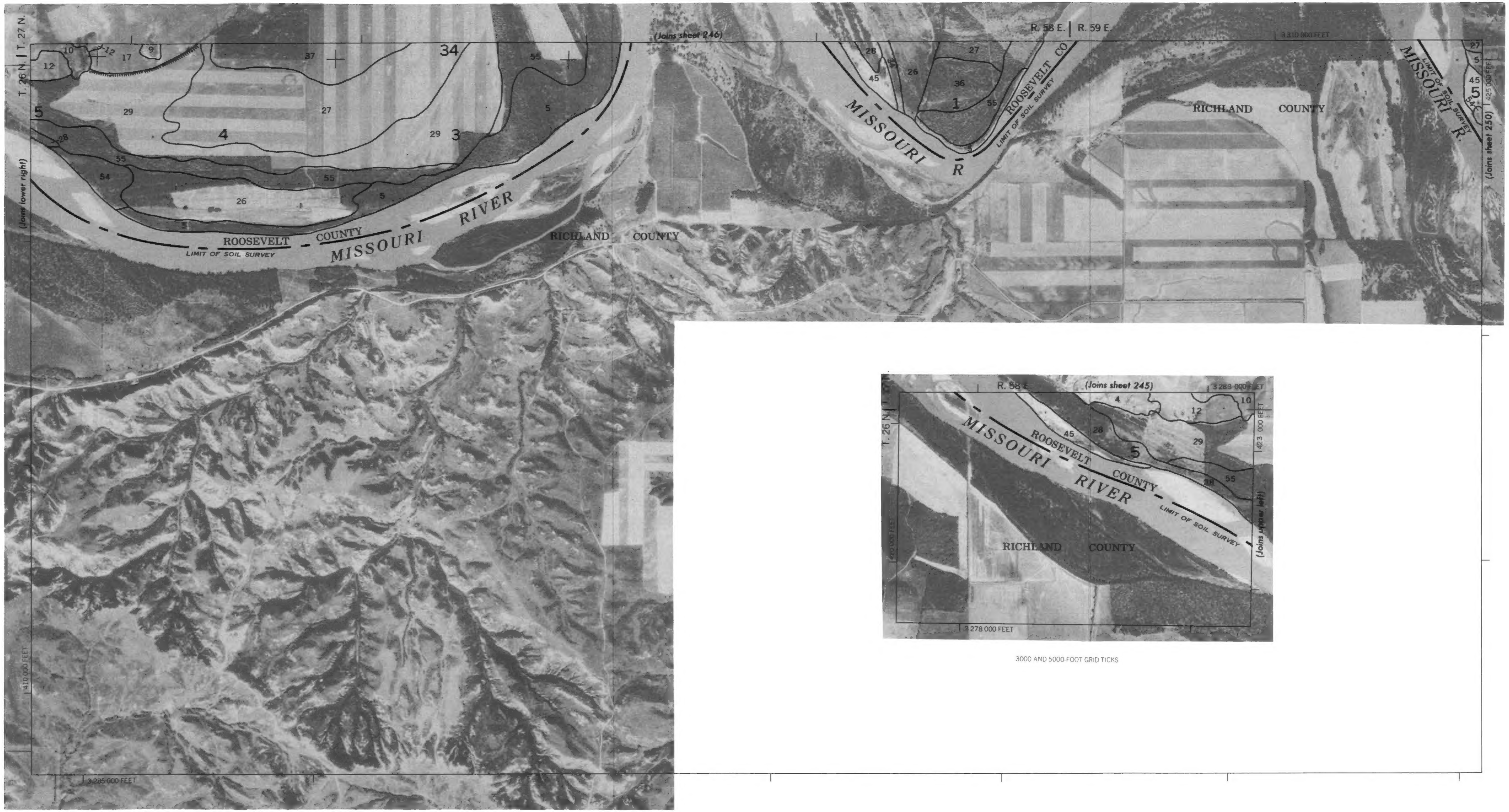


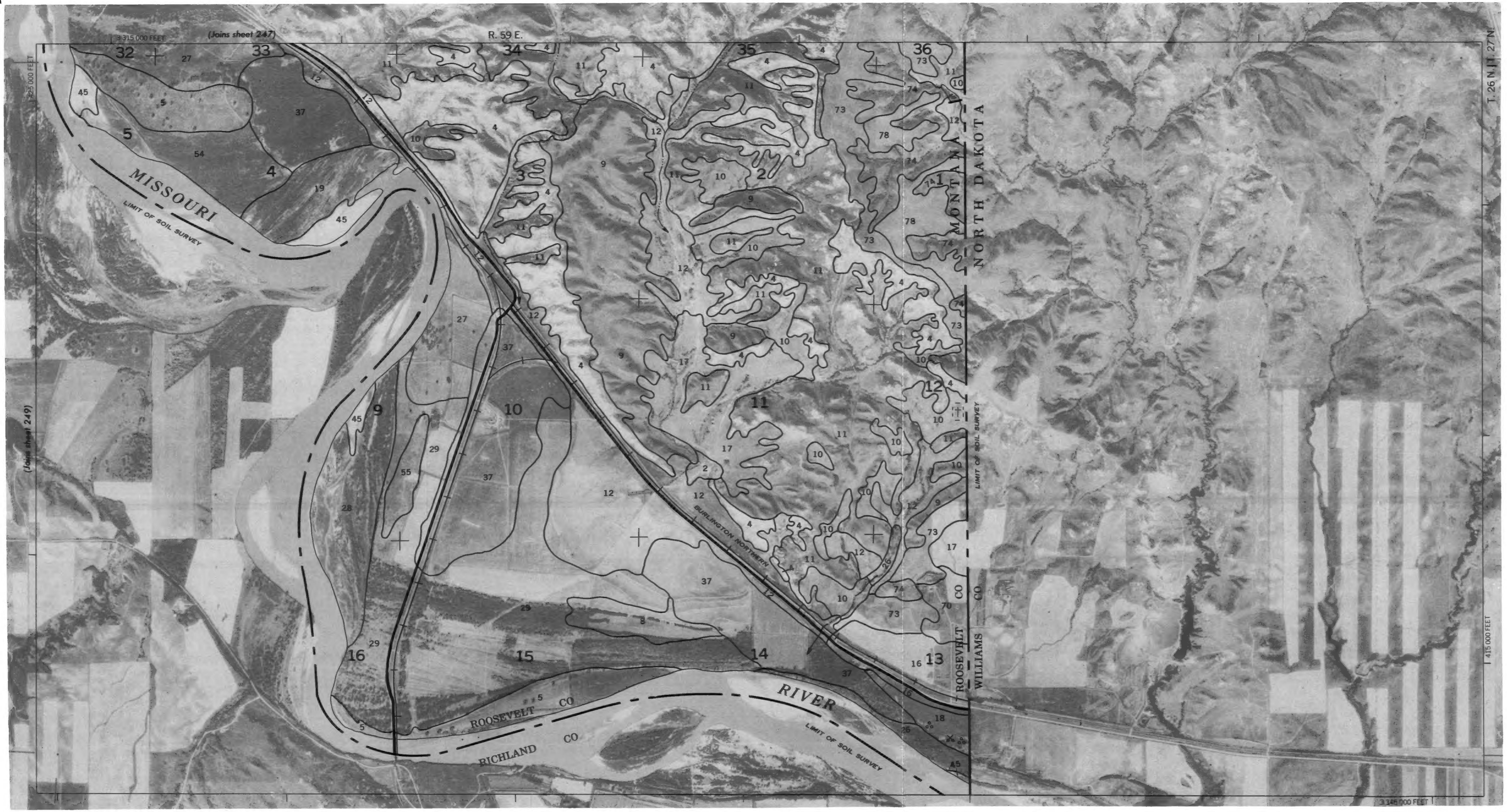
1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

N

ROOSEVELT AND DANIELS COUNTIES, MONTANA — SHEET NUMBER 250



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

Coordinate grid ticks and land division corners, if shown, are approximately positioned.

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